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BULLETIN

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Family Nomenclature.

By John Hendley Barnhart.

Although for over a hundred years botanists have recognized certain natural groups of plants, variously called "orders" or "families," the naming of these groups has been full of inconsistencies, and subject entirely to the caprice of each writer. When we come to consider the fact that no author has ever consistently followed any rule in naming such groups (some have even called the same family by two or more different names in the same work) it seems strange that the present confusion is no greater than it is.

In spite of the fact that there are no rules, there is a marked tendency toward the use of uniform terminations in the naming of all groups of coördinate rank higher than genera. In the case of family names this tendency has shown itself by the extension of the use of the termination "-aceae," until this has become universally recognized as a distinctive mark of family rank. Yet some of the usual names are improperly formed from the generic root upon which they are based, while quite a number of the families retain names which are not founded upon genera at all.

This latter class requires special consideration. A generic name stands or falls with its typical species, and why should not a family name stand or fall with its typical genus? Such names as Umbelliferae, Cruciferae, Leguminosae, Labiatae, Gramineae, Compositae, etc., are not named after genera. Nor do these names express characteristics peculiar to the families to which they are applied. The Araliaceae are as truly umbelliferous as the Umbelliferae; the Capparidaceae, like the Cruciferae, have cruciform flowers; in the Dipsacaceae the flowers are "composite," as in the Compositae. Not being founded upon genera, such names may be applied to very different groups, even though they have the correct termination -aceae. The name Lomentaceae has been used for a division of Leguminosae, and also for a group of Cruciferae, and these two applications of the name, while equally appropriate, are at the same time alike improper. Custom, then, is the only excuse for the continued use of this class of names. But it has proven true in the case of generic and specific nomenclature, that *custom must yield to inflexible law;* and surely the same should hold in the case of family nomenclature.

What, then, should this law be? The evident preponderance of opinion demands as its most important feature the uniform termination -aceae. Then it must be recognized that the family names must be properly formed from the roots of generic names. Next in importance is the law of priority, so necessary for stable botanical nomenclature. As the history of family names is followed out practical questions arise from time to time, and for their decision new provisions suggest themselves, and in this way gradually have been formulated the following rules for family nomenclature, which it is the object of this sketch to propose.

Rules for Family Nomenclature.

Rule 1. The name of each natural family shall consist of the root of the accepted name of a recognized genus belonging to that family, with the addition of the termination *aceae.*

Rule 2. The name of each natural family shall be the oldest name published in accordance with Rule 1, for any group of plants, based upon the accepted name of any recognized genus belonging to that family.

Rule 3. The family name must be published in Latin, and in the plural number, though not necessarily in the nominative case.

Rule 4. Authorities shall be cited for family names in the same manner as for generic names. If the original author of a family name spells the root incorrectly, his name shall be cited in parentheses, followed by the proper citation of the authority who first spells the name correctly.

Rule 5. In conformity with the accepted rules of generic and specific nomenclature, no family name shall be accepted on the authority of any work published prior to the first edition of Linné's Species Plantarum, in 1753.

The words "order" and "family" have usually been used interchangeably in botany, but judging from the present tendency it appears likely that in the future the name "order" will be restricted, as has long been the case in zoölogy, to groups of higher rank than families. For this reason the word family has been used in the proposed rules.

It will be well, perhaps, to elucidate the various points touched upon by the rules, by giving a few illustrations.

Rule 1. The family name should consist of a generic *root* with the termination *-aceae*. Thus the family founded on the genus *Triuris* (root: TRIURID) should be called *Triurid*aceae, Lindl., not *Triur*aceae, Gardn., nor yet *Triuri*aceae, Miers.

It should be based on the name of a recognized genus. "Palmaceae" is not founded on a *genus*, and cannot stand. "Aquifoliaceae" is founded upon the genus *Aquifolium*, which is not now usually recognized, but is considered a section of *Ilex*. The author who thus disposes of *Aquifolium* cannot consistently use the name Aquifoliaceae.

It should be founded on the *accepted* name of a genus. The genus on which Lindley established his family Roxburghiaceae is still recognized, but its *accepted* name at present is the older one *Stemona*, and hence for the family must be accepted the newer name Stemonaceae.

Rule 2. Over twenty-five names have been proposed ending in -aceae and founded upon genera now included in the family Liliaceae. Of these the oldest which fulfills the conditions of Rule 1 is the one just mentioned, which was proposed by Adanson in 1763.

Rule 3. In 1819 De Candolle published the new families which he called, in French, "Fumariacées" and Frankeniacées" (Théor. Élém. 244), but they were not published in Latin for two years, when S. F. Gray published Frankeniaceae, and De Candolle himself Fumariaceae. Again, Schlechtendal, in Linnaea, in 1826, referred to the "Melanthiaceen," but the Latin name first appeared in 1830 in Lindley's Natural System.

Bartling, in 1830 (Ord. Nat. 144), proposed a group "Centaureacea." This form was probably intended for the neuter plural, but might be the singular of Centaureaceae. In any event it does not fulfil the requirements of this rule. However, in 1873, Pfeiffer, in his Nomenclator Botanicus, referring to Bartling, spells the name Centaureaceae, thus duly publishing it.

In 1825 Nees von Esenbeck, making a list of the plants belonging to the family which he called "Gesneriées," entitled the list "Generum familiae Gessneriacearum brevis expositio." Although the name Gessneriaceae occurs nowhere else in the article, and in this instance only in the genitive case, this constitutes a true publication of the name according to the rule under consideration.

Rule 4. Citation. There are many illustrations of this rule in the accompanying list.

Rule 5. While this rule brings family nomenclature into line with specific and generic naming, it is desirable for another reason. In 1759 Bernard de Jussieu laid the foundation of the Natural System, which is now so universally accepted. As nothing on the subject was published between 1753 and 1759, the latter date might have been taken as a starting-point but for the convenience of uniformity.

The following list has been prepared in accordance with, and in illustration of, the proposed rules. The omissions may be many; the errors, it is to be hoped, are few. Additions to this list and corrections of it will be gratefully received.

It will be well to remember, however, that many of the references in published books are not to be trusted, for they refer to places where the group is *described*, it may be under a very different name.

List of the Natural Families According to the Classification Adopted in Engler and Prantl's Natuerlichen Pflanzenfamilien. Corrected in accordance with the proposed rules.

This list includes only the Spermatophyta or seed-producing plants; it includes only names which end in -aceae; it includes only names which are formed, directly or indirectly, from the name of some genus. This last restriction throws out such names as:

AMENTACEAE,
AMPELIDACEAE,
ANTHERACEAE,
ASPERFOLIACEAE,
AURANTIACEAE,
BALSAMACEAE,
CAMPANACEAE,
CERACEAE,
CEREACEAE,
CHLAENACEAE,
COMPOSITACEAE,
CONACEAE,
DRUPACEAE,
ERUCACEAE,
FICOIDACEAE,
FRUMENTACEAE,
GLUMACEAE,
GRAMINACEAE,
GRANATACEAE,
GROSSULACEAE,
HIPPOCASTANACEAE,
HOLORACEAE,
HYDROCARYACEAE,
LABIACEAE,
LABIATACEAE,
LENTICULACEAE,
LENTISCACEAE,
LOMENTACEAE,
LUPULACEAE,
NUCAMENTACEAE,
NUCULACEAE,
OLERACEAE,
PALMACEAE,
PAPILIONACEAE,
PATMACEAE,
PISTILLACEAE,
POMACEAE,
POTAMIACEAE,
PYRENACEAE,
ROTACEAE,
SAPONACEAE,
SARMENTACEAE,
SCITAMINACEAE,
SPATHACEAE,
STELLACEAE,
STROBILACEAE,
SYNANTHERACEAE,
UMBELLACEAE, ETC.

Names formed by prefixing Eu- to the generic root have been omitted also, as

EUBUXACEAE, EULACTUCACEAE, EULOBELIACEAE, EUVERNONIACEAE.

The signs used are as follows:

* Signifies that the family name is founded on more or less than the root of the generic name. In some of these cases it is formed by the addition of "-eae" to generic roots ending in "ac"; e. g. Smilac-eae. Such names are perfectly correct for tribes, though improper for families.

† Indicates that the generic root is wrongly spelled.

‡ Marks family names formed from generic names which are not recognized by Engler and Prantl.

§ After a citation means that it is accepted on some authority believed to be trustworthy, but the reference has not been verified by actual comparison with the original work. In any such case it is possible that the publication may not have been in accordance with the proposed rules.

The families which, in this list, are numbered respectively 129–137, 153–159, 175–182, 208–210, 227–229, 234, 235, and 243–248 (all inclusive) have not yet been treated by Engler and Prantl, and of course their exact limitations and the generic names which will be recognized are largely matters of conjecture.

1. CYCADACEAE Lindl. Nat. Syst. Ed. 2, 312 (1836).
    CYCADEACEAE* Reichb. Consp. 40 (1828).
    ZAMIACEAE Reichb. Handb. 139 (1837).
2. CORDAITACEAE Engler; Engl. & Pr. Nat. Pfl. 2: part 1: 26 (1889).
3. PINACEAE Lindl. Nat. Syst. Ed. 2, 313 (1836).
    DAMMARACEAE‡ Link, Abh. Berl. Ak. f. 1827, 157 (1830).
    SALISBURIACEAE‡ Link, Handb. 2: 523 (1831).
    TAXACEAE Lindl. Nat. Syst. Ed. 2, 316 (1836).
    PINEACEAE* Horan. Tetract. Nat. 22 (1843).
    JUNIPERACEAE Horan. Tetract. Nat. 22 (1843).
    CUPRESSACEAE Walp. Ann. Bot. 3: 444 (1853).
    ABIETACEAE Walp. Ann. Bot. 3: 446 (1853).
    PODOCARPACEAE Walp. Ann. Bot. 3: 448 (1853).
    ABIETINACEAE* Kl. & Grcke. Bot. Erg. Wald. 31 (1862).
    TAXODIACEAE Schimp. Paleont. Veg. 2: 309 (1870).
    ARAUCARIACEAE Strasb. Conif. 25 (1872).
    Called CONIFERAE by Engler & Prantl.
4. EPHEDRACEAE Dumort. Fl. Belg. 9 (1827).§
    THOACEAE‡ Agardh, Aphor. 204 (1825).
    GNETACEAE Lindl. Bot. Reg. *t. 1686* (1834).§
5. TYPHACEAE J. St. Hil. Expos. Fam. 1: 60 (1805).
6. PANDANACEAE Lindl. Nat. Syst. Ed. 2, 361 (1836).
7. SPARGANIACEAE Agardh, Theor. Syst. Pl. 13 (1858).
8. ZANNICHELLIACEAE Dumort. Anal. Fam. 61 (1829).
    ZANICHELLIACEAE† Dumort. Anal. Fam. 59 (1829).
    ZOSTERACEAE Dumort. Anal. Fam. 65, 66 (1829).
    RUPPIACEAE Horan. Tetract. Nat. 22 (1843).
    POTAMOGETONACEAE Engl. Fuehr. Bresl. Bot. Gart. 18 (1886).§
    POSIDONIACEAE Kerner, Pflanzenleb. 2: 644 (1891).
    CYMODOCEACEAE Kerner, Pflanzenleb. 2: 644 (1891).
9. NAJADACEAE (Lindl.) Asch. Linnaea, 35: 160 (1867).
    NAIADACEAE Lindl. Nat. Syst. Ed. 2, 366 (1836).
10. APONOGETONACEAE Engler, Bot. Jahrb. 8: 261 (1887).
    APONOGETACEAE* Agardh, Theor. Syst. Pl. 44 (1858).
11. SCHEUCHZERIACEAE Agardh, Theor. Syst. Pl. 44 (1858).
    JUNCAGINACEAE‡ Lindl. Nat. Syst. Ed. 2, 367 (1836).
    LILAEACEAE Hieron. Ber. Ges. Nat. Berl. 116 (1878).§
12. ALISMACEAE DC. Fl. Franc. 3: 181 (1805).
13. BUTOMACEAE S. F. Gray, Arr. Brit. Pl. 2: 217 (1821).
14. TRIURIDACEAE Lindl. Veg. Kingd. 213 (1847).
    TRIURACEAE* Gardn. Trans. Linn. Soc. 19: 160 (1843).
    TRIURIACEAE* Miers, Trans. Linn. Soc. 21: 43 (1850).

15. ELODEACEAE Dumort. Anal. Fam. 54 (1829).
Vallisneriaceae Dumort. Anal. Fam. 54, 55 (1829).
Hydrocharaceae* Lindl. Nat. Syst. Ed. 2, 335 (1836).
Hydrocharidaceae† Lindl. Veg. Kingd. 141 (1847).
Hydrocharitaceae (Lindl.) Asch. Linnaea, 35: 158 (1867).
Halophilaceae Kerner, Pflanzenleb. 2: 644 (1891).
Stratiotaceae Kerner, Pflanzenleb. 2: 645 (1891).
Otteliaceae Kerner, Pflanzenleb. 2: 645 (1891).
Thalassoidaceae† Kerner, Pflanzenleb. 2: 645 (1891).
Blyxeaceae* Kerner, Pflanzenleb. 2: 645 (1891).
Hydrillaceae Kerner, Pflanzenleb. 2: 645 (1891).
16. POACEAE R. Brown, Flind. Voy. App. 2, 583 (1814).
Stipaceae HBK. Nov. Gen. 1: 121 (1815).
Avenaceae HBK. Nov. Gen. 1: 143 (1815).
Festucaceae HBK. Nov. Gen. 1: 143 (1815).
Arundinaceae HBK. Nov. Gen. 1: 148 (1815).
Hordeaceae HBK. Nov. Gen. 1: 179 (1815).
Olyraceae HBK. Nov. Gen. 1: 196 (1815).
Bambusaceae HBK. Nov. Gen. 1: 199 (1815).
Bromaceae Dumort. Agrost. Belg. 82 (1823).
Phleaceae Dumort. Agrost. Belg. 83 (1823).
Loliaceae Dumort. Agrost. Belg. 95 (1823).
Miliaceae Dumort. Agrost. Belg. 135 (1823).
Spartinaceae Link, Hort. Berol. 1: 46 (1827).§
Echinariaceae Link, Hort. Berol. 1: 197 (1827).§
Chondrosiaceae‡ Link, Hort. Berol. 1: 269 (1827).§
Paspalaceae Link, Hort. Berol. 1: 269 (1827).§
Melicaceae Link, Hort. Berol. 1: 271 (1827).§
Zeaceae Reichb. Consp. 55 (1828).
Tripsaceae* Dumort. Anal. Fam. 64 (1829).
Rottboelliaceae Kunth, Gram. 150 (1830).§
Anthistiriaceae Presl, Reliq. Haenk. 1: (1830).§
Vilfaceae‡ Trinius, Linnaea, 10: 302 (1835).
Sesleriaceae W. Koch, Synops 788 (1837).
Pappophoreaceae* Parlat. Fl. Palerm. 1: 127 (1845).§
Sessleriaceae† Fries, Summ. Veg. Scand. 1: 80 (1846).
Agrostaceae* Pfeiff. Nomencl. Bot. 1: 85 (1873).
Called Gramineae by Engler and Prantl.
17. CYPERACEAE J. St. Hil. Expos. Fam. 1: 62 (1805).
Elynaceae Reichb. Consp. 55 (1828).
Scleriaceae Reichb. Consp. 56 (1828).
Scirpaceae Kerner, Pflanzenleb. 2: 654 (1891).
18. ARECACEAE Reichb. Consp. 72 (1828).
CorYphaceae Reichb. Consp. 73 (1828).
Nipaceae Brongn. Enum. Genr. 15 (1843).
Sabalaceae Schimp. Paleont. Veg. 2: 486 (1871).
Phoenicaceae Schimp. Paleont. Veg. 2: 496 (1871).

Borassaceae Schimp. Paleont. Veg. 2: 499 (1871).
Lepidocaryaceae Kerner, Pflanzenleb. 2: 649 (1891).
Ceroxylonaceae* Kerner, Pflanzenleb. 2: 649 (1891).
Phytelephantaceae Kerner, Pflanzenleb. 2: 649 (1891).
Called Palmae by Engler and Prantl.

19. CYCLANTHACEAE Lindl. Nat. Syst. Ed. 2, 362 (1836).
Ludoviaceae Drude; Engl. & Pr. Nat. Pfl. 2: part 3, 93 (1889).

20. ARACEAE Neck. Act. Ac. Theod. Palat. 2: 462 (1770).
Orontiaceae R. Brown, Prodr. 1: 337 (1810).
Pistiaceae HBK. Nov. Gen. 1: 81 (1815).
Callaceae Reichb. Consp. 44 (1828).
Acoraceae Lindl. Nat. Syst. Ed. 2, 365 (1836).
Colocasiaceae Kerner, Pflanzenleb. 2: 646 (1891).
Philodendraceae Kerner, Pflanzenleb. 2: 646 (1891).
Lasiaceae Kerner, Pflanzenleb. 2: 646 (1891).
Monsteraceae Kerner, Pflanzenleb. 2: 646 (1891).
Pothoidaceae* Kerner, Pflanzenleb. 2: 646 (1891).

21. LEMNACEAE Dumort. Fl. Belg. 147 (1827).§

22. FLAGELLARIACEAE Agardh, Theor. Syst. Pl. 20 (1858).

23. RESTIONACEAE Hieron.; Engl. & Pr. Nat. Pfl. 2: part 4, 3 (1888).
Restiaceae* R. Brown, Prodr. 1: 243 (1810).

24. CENTROLEPIDACEAE Hieron. Abh. Nat. Ges. Halle, 205 (1873).
Devauxiaceae†‡ Dumort. Anal. Fam. 62, 63 (1829).
Desvauxiaceae‡ Lindl. Nat. Syst. Ed. 2, 386 (1836).

25. MAYACACEAE Walp. Ann. Bot. 3: 662 (1853).
Mayaceae* Meisn. Pl. Vasc. Gen. 406, 407 (1842).

26. XYRIDACEAE Lindl. Nat. Syst. Ed. 2, 388 (1836).

27. ERIOCAULACEAE Lindl. Veg. Kingd. 122 (1847).
Eriocaulonaceae* OK. Rev. Gen. 745 (1891).

28. RÁPATEACEAE Dumort. Anal. Fam. 60, 62 (1829).

29. BROMELIACEAE J. St. Hil. Expos. Fam. 1: 122 (1805).

30. COMMELINACEAE Reichb. Consp. 57 (1828).
Commelynaceae† Endl. Gen. 124 (1837).

31. PONTEDERIACEAE Dumort. Anal. Fam. 59, 61 (1829).
Pontederaceae* Martius, Consp. 7 (1835).
Pontederaeaceae† OK. Rev. Gen. 718 (1891).

32. PHILYDRACEAE Lindl. Nat. Syst. Ed. 2, 357 (1836).
Phylidraceae† Horan. Tetract. Nat. 22 (1843).

33. JUNCACEAE (Vent.) Dumort. Comm. Bot. 66 (1822).
Joncaceae† Vent. Tabl. 2: 150 (1799).

34. STEMONACEAE Fr. & Sav. Enum. Pl. Jap. 2: 92 (1879).
Roxburghiaceae‡ Wallich, Pl. As. Rar. 3: 50 (1832).

35. LILIACEAE Adans. Fam. Pl. 2: 42 (1763).
Alliaceae Batsch, Gen. Pl. Jenens. 10, 30 (1786).
Tulipaceae Batsch, Gen. Pl. Jenens. 11, 30 (1786).
Smilaceae* Vent. Tabl. 2: 146 (1799).
Colchicaceae DC. Fl. Franç. 3: 192 (1805).

Melanthaceae* R. Brown, Prodr. 1: 272 (1810).
Asphodeliaceae* S. F. Gray, Arr. Brit. Pl. 2: 174 (1821).
Phylesiaceae† Dumort. Anal. Fam. 53, 54 (1829).
Asteliaceae Dumort. Anal. Fam. 59, 61 (1829).
Xanthorhaeaceae† Dumort. Anal. Fam. 60, 62 (1829).
Philesiaceae Dumort. Anal. Fam. 97 (1829).
Convallariaceae Link, Handb. 1: 184 (1829).
Dracaenaceae Link, Handb. 1: 187 (1829).
Melanthiaceae Lindl. Nat. Syst. Ed. 1 (1830).§
Trilliaceae Lindl. Nat. Syst. Ed. 2, 347 (1836).
Gilliesiaceae Lindl. Nat. Syst. Ed. 2, 348 (1836).
Kingiaceae Endl. Gen. 132 (1837).
Laxmanniaceae Horan. Tetract. Nat. 23 (1843).
Funkiaceae† Horan. Tetract. Nat. 23 (1843).
Asphodelaceae Horan. Tetract. Nat. 23 (1843).
Haworthiaceae Horan. Tetract. Nat. 23 (1843).
Asparagaceae Horan. Tetract. Nat. 23 (1843).
Nartheciaceae Fries, Summ. Veg. Scand. 1: 65 (1846).
Lapageriaceae Kunth; Walp. Ann. Bot. 3: 646 (1853).
Herreriaceae Kunth; Walp. Ann. Bot. 3: 646 (1853).
Ophiopogonaceae Kunth; Walp. Ann. Bot. 3; 646 (1853).
Aspidistraceae Kunth; Walp. Ann. Bot. 3: 646 (1853).
Uvulariaceae Walp. Ann. Bot. Bot. 3: 650 (1853).
Phormiaceae Agardh. Theor. Syst. Pl. 7 (1858).

36. HAEMODORACEAE R. Brown, Prodr. 1: 299 (1810).
Haemadoraceae† Reichb. Consp. 60 (1828).
Hemodoraceae† Dumort. Anal. Fam. 58 (1829).
Wachendorfiaceae Dumort. Anal. Fam. 61 (1829).
Hoemodoraceae† A. Rich. Sert. Astrol. 80 (1834).

37. LEUCOJACEAE Batsch, Gen. Pl. Jenens. 10, 30 (1786).
Alstroemeriaceae Dumort. Anal. Fam. 58 (1829).
Campynemaceae Dumort. Anal. Fam. 58 (1829).
Agaveaceae Dumort. Anal. Fam. 58 (1829).
Amaryllidaceae Lindl. Nat. Syst. Ed. 2, 328 (1836).
Pancratiaceae Horan. Tetract. Nat. 23 (1843).
Hyypoxidaceae Lindl. Veg. Kingd. 154 (1847).

38. VELLOZIACEAE Drude, Phanerog. 333 (1879).

39. TACCACEAE Reichb. Consp. 44 (1828).

40. TAMACEAE Gray, Arr. Brit. Pl. 2: 189 (1821).
Dioscoreaceae Lindl. Nat. Syst. Ed. 2, 359 (1836).
Dioscoridaceae† Kl. & Grcke. Bot. Erg. Wald. 42, 55 (1862).
Stenomeridaceae Kerner, Pflanzenleb. 2: 666 (1891).

41. IXIACEAE Ecklon, Verzeichn 18 (1827).§
Moraeaceae Dumort. Anal. Fam. 58 (1829).
Iridaceae Lindl. Nat. Syst. Ed. 2, 332 (1836).

42. MUSACEAE J. St. Hil. Expos. Fam. 1: 151 (1805).

43. ALPINIACEAE Link. Enum. 1: 228 (1821).
Curcumaceae Dumort. Anal. Fam. 20, 25 (1829).
Zingiberaceae Lindl. Nat. Syst. Ed. 2, 322 (1836).
Amomaceae Horan. Tetract. Nat. 22 (1843).
44. CANNACEAE Link, Enum. 1: 1 (1821).
45. MARANTACEAE Lindl. Nat. Syst. Ed. 1 (1830).
46. BURMANNIACEAE Blume, Enum. Pl. Jav. 1: 27 (1830).
Thismiaceae Miquel, Fl. Ind. Bat. 3: 615 (1858) §
Arachnitaceae Philippi, Cat. Pl. Vasc. Chil. 278 (1881).
47. ORCHIDACEAE Lindl. Nat. Syst. Ed. 2, 336 (1836).
Vanillaceae Lindl. Nat. Syst. Ed. 2, 341 (1836).
Apostasiaceae Lindl. Nat. Syst. Ed. 2, 342 (1836).
Limodoraceae Horan. Tetract. Nat. 22 (1843).
Neottiaceae Reichb. f. Poll. Orch. Gen. 9 (1852).§
Cohniaceae‡ Reichb. f. Bot. Zeit. 929 (1852).
Rodrigueziaceae Reichb. f. Bot. Zeit. 929 (1852).
Chloraeaceae Reichb. f. Bot. Zeit. 1 (1853).
Cypripediaceae Kl. & Grcke. Bot. Erg. Wald. 33, 38 (1862).
Ophrydaceae Kerner, Pflanzenleb. 2: 661 (1891).
Epidendraceae Kerner, Pflanzenleb. 2: 661 (1891).
Vandaceae Kerner, Pflanzenleb. 2: 661 (1891).
48 SAURURACEAE Lindl. Nat. Syst. Ed. 2, 184 (1836).
49. PIPERACEAE HBK. Nov. Gen. 1: 46 (1815).
50. CHLORANTHACEAE Blume, Enum. Pl. Jav. 1: 78 (1830).
51. LACISTEMACEAE Lindl. Nat. Syst. Ed. 2, 183 (1836).
52. CASUARINACEAE Lindl. Veg. Kingd. 249 (1847).
Casuaraceae* Lindl. Nat. Syst. Ed. 2, 181 (1836).
53. JUGLANDACEAE Lindl. Nat. Syst. Ed. 2, 180 (1836).
54. MYRICACEAE Dumort. Anal. Fam. 95 (1829).
55. LEITNERIACEAE Drude, Phanerog. 407 (1879).
56. SALICACEAE Lindl. Nat. Syst. Ed. 2, 186 (1836).
57. CORYLACEAE Mirbel, Élém. 2: 296 (1815).
Betulaceae Agardh, Aphor. 208 (1825).
58. FAGACEAE Drude, Phanerog. 409 (1879).
Castaneaceae Baill. Dict. Bot. 1: 650 (1884?).
59. ULMACEAE Mirbel, Élém. 2: 905 (1815).
Celtidaceae Walp. Ann. Bot. 3: 394 (1853).
60. ARTOCARPACEAE Horan. Tetract. Nat. 25 (1843).
Cannabinaceae Lindl. Veg. Kingd. 265 (1847).
Moraceae Lindl. Veg. Kingd. 266 (1847).
Cannabaceae* A. Braun; Asch. Fl. Brand. 58 (1864).§
Dorsteniaceae Kerner, Pflanzenleb. 2: 680 (1891).
Conocephalaceae Kerner, Pflanzenleb. 2: 680 (1891).
61. URTICACEAE Reichb. Consp. 83 (1828).
Phenaceae* Weddell, Ann. Sc. Nat. Ser. 4, 1: 175 (1854).
62. PROTEACEAE J. St. Hil. Expos. Fam. 1: 185 (1805).
Personiaceae† Klotsch, Linnaea 20: 471 (1847).

63. LORANTHACEAE D. Don. Prodr. Fl. Nepal. 142 (1825).
Viscaceae Miers, Ann. & Mag. N. H. (II.) **8**: 179 (1851).
64. MYZODENDRACEAE Hieron.; Engl. & Pr. Nat. Pfl. **3**: part **1**, 198 (1889).
65. SANTALACEAE R. Brown, Prodr. **1**: 350 (1810).
Canopiaceae‡ Presl. Epimel. Bot. 608 (1850).§
66. GRUBBIACEAE Endl. Gen. 327 (1838).
67. OLACACEAE Lindl. Nat. Syst. Ed. **2**, 32 (1836).
Olaceae* Benth. Trans. Linn. **18**: 677 (1841).
Schoepfiaceae Blume, Mus. Bot. Lugd. **1**: 175 (1850).
Aptandraceae Miers, Ann. & Mag. N. H. Ser. **2**, **7**: 206 (1851).
Olacinaceae* Kl. & Grcke. Bot. Erg. Wald. 151 (1862).
68. CYNOMORIACEAE Lindl. Nat. Syst. Ed. **2**, 394 (1836).
Balanophoraceae Lindl. Nat. Syst. Ed. **2**, 525 (1836).
Lathraeophilaceae Leand. de Sacram.; A. St. Hil. Ann. Sc. Nat. Ser **2**. **7**: 32 (1837).
Lophophytaceae Horan. Tetract. Nat. **21** (1843).
Sarcophytaceae Kerner, Pflanzenleb. **2**; 708 (1891).
Scybaliaceae Kerner, Pflanzenleb. **2**: 708 (1891).
69. ASARACEAE Link, Enum. **2**: 1 (1822).
Aristolochiaceae Blume, Enum. Pl. Jav. **1**: 81 (1830).
Apamaceae Kerner, Pflanzenleb. **2**: 700 (1891).
70. RAFFLESIACEAE Dumort. Anal. Fam. 13, 14 (1829).
Cytinaceae Lindl. Nat. Syst. Ed. **2**, 392 (1836).
Apodanthaceae Kerner, Pflanzenleb. **2**: 700 (1891).
71. HYDNORACEAE Graf zu Solms, Bot. Zeit. 66 (1874).§
72. POLYGONACEAE Lindl. Nat. Syst. Ed. **2**, 211 (1836).
Eriogonaceae Walp. Ann. Bot. **3**: 297 (1853).
73. CHENOPODIACEAE Dumort. Anal. Fam. 15, 17 (1829).
Chenopodeaceae† Martius, Consp. 15 (1835).
Salsolaceae Moq.-Tand.; DC. Prodr. **13**: part **2**, 41 (1849).
Atriplicaceae Simonkai, Enum. Fl. Trans. 465 (1886).
74. AMARANTACEAE (J. St. Hil.) Martius, Nov. Act. Ac. Leop. **13**: part **1**, 215 (1826).
Amaranthaceae† J. St. Hil. Expos. Fam. **1**: 204 (1805).
75. BATIDACEAE Dammer; Engl. & Pr. Nat. Pfl. **3**: part 1a, 118 (1893).
76. CYNOCRAMBACEAE Pouls.; Engl. & Pr. Nat. Pfl. **3**: part 1a, 121 (1893).
Thelygonaceae‡ Caruel, Nuov. Giorn. Bot. It. **5**: 170 (1873).
77. BASELLACEAE Moq.-Tand. Chenop. x (1840).
78. PETIVERIACEAE Link, Handb. **1**: 392 (1829).
Riviniaceae† Dumort. Anal. Fam. 17 (1829).
Petiveraceae* Lindl. Nix. Pl. 16 (1833).
Phytolaccaceae Lindl. Nat. Syst. Ed. **2**, 210 (1836).
79. ALLIONIACEAE Reichb. Consp. 85 (1828).
Nyctaginaceae‡ Lindl. Nat. Syst. Ed. **2**, 213 (1836).
80. TETRAGONIACEAE Reichb.; Moessl. Handb. **1**: 52 (1827).§
Mesembryaceae* Lindl. Nat. Syst. Ed. **2**, 56 (1836).
Sesuviaceae Horan. Tetract. Nat. 29 (1843).

Aizoaceae A. Braun; Asch. Fl. Brand. 60 (1864).§
Mesembrianthemaceae Lowe, Fl. Madeir. 306 (1868).
Molluginaceae Rohrb.; Martius, Fl. Bras. 14: part 2, 228 (1872).
81. PORTULACACEAE Reichb. Consp. 161 (1828).
Portulaceae* Juss. Gen. 312 (1789).
82. ALSINACEAE Wahlenb. Fl. Suec. 2: lxxiv (1824).
Corrigiolaceae Reichb.; Moessl. Handb. 1: 51 (1827).§
Stellariaceae Dumort. Fl. Belg. 106 (1827) §
Queriaceae DC. Prodr. 3: 379 (1828).
Caryophyllaceae‡ Reichb. Consp. 206 (1828).
Telephiaceae Link, Handb. 2: 45 (1831).
Paronychiaceae Link, Handb. 2: 420 (1831).
Silenaceae Lindl. Nat. Syst. Ed. 2, 124 (1836).
Illecebraceae Lindl. Nat. Syst. Ed. 2, 127 (1836).
Scleranthaceae Lindl. Nat. Syst. Ed. 2, 213 (1836).
Malachiaceae‡ C. Koch, Linnaea, 15: 709 (1841).
Loefflingiaceae† Fzl.; Walp. Repert. 1: 263 (1843).
83. NYMPHAEACEAE DC. Propr. Méd. Ed. 2, 119 (1816).
Nelumbiaceae† Lindl. Nat. Syst. Ed. 2, 13 (1836).
Cabombaceae A. Gray, Ann. Lyc. N. Y. 4: 46 (1837).
Euryalaceae Kerner, Pflanzenleb. 2: 699 (1891).
Nupharaceae Kerner, Pflanzenleb. 2: 699 (1891).
Barclayaceae Kerner, Pflanzenleb. 2; 699 (1891).
84. CERATOPHYLLACEAE A. Gray, Ann. Lyc. N. Y. 4: 41 (1837).
85. MAGNOLIACEAE J. St. Hil. Expos. Fam. 2: 74 (1805).
Schizandriaceae* G. Don, Gen. Syst. 1: 101 (1831).
Schizandraceae Martius, Consp. 39 (1835).
Winteraceae‡ Lindl. Nat. Syst. Ed. 2, 17 (1836).
86. LACTORIDACEAE Engler, Bot. Jahrb. 8: 53 (1887).
87. TROCHODENDRACEAE Prantl; Engl. & Pr. Nat. Pfl. 3, part 2: 21 (1891).
88. ANONACEAE DC. Syst. 1: 463 (1818).
Annonaceae† Link, Enum. 2: 87 (1822).
89. MYRISTICACEAE Lindl. Nat. Syst. Ed. 2, 15 (1836).
90. RANUNCULACEAE Juss. Gen. 231 (1789).
Paeoniaceae DC. Prodr. 1: 64 (1824).
Calthaceae Presl, Fl. Sicul. 1: 20 (1826).§
Poeoniaceae† Presl, Fl. Sicul. 1: 26 (1826).§
Helleboraceae Spach, Hist. Veg. Phan. 7: 285 (1839).§
Nigellaceae Agardh, Theor. Syst. Pl. 76 (1858).
91. LARDIZABALACEAE Lindl. Veg. Kingd. 303 (1847).
92. PODOPHYLLACEAE DC. Prodr. 1: 111 (1824).
Diphylleiaceae Schultz, Nat. Syst. Pfl. 328 (1832).
Berberaceae* Lindl. Nat. Syst. Ed. 2, 7 (1836).
Berberidaceae Torr. & Gr. Fl. N. Am. 1: 49 (1838).
Nandinaceae Horan. Tetract. Nat. 30 (1843).

93. MENISPERMACEAE DC. Prodr. 1: 95 (1824).
94. CALYCANTHACEAE Lindl. Nat. Syst. Ed. 2, 159 (1836).
95. MONIMIACEAE Dumort. Anal. Fam. 16 (1829).
    Atherospermaceae Lindl. Nat. Syst. Ed. 2, 189 (1836).
96. CASSYTHACEAE Dumort. Anal. Fam. 16 (1829).
    Lauraceae Lindl. Nat. Syst. Ed. 2, 200 (1836).
    Cassytaceae† Horan. Tetract. Nat. 24 (1843).
    Perseaceae Horan. Tetract Nat. 25 (1843).
    Litseaceae Benth. & Hook. Gen. Pl. 3: 149, 160 (1880).
97. HERNANDIACEAE Dumort. Anal. Fam. 14, 16 (1829).
    Illigeraceae Lindl. Nat. Syst. Ed. 2, 202 (1836).
    Gyrocarpaceae Kl. & Grcke. Bot. Erg. Wald. 151 (1862).
98. PAPAVERACEAE B. Juss. Hort. Trian. (1759).
    Fumariaceae DC. Syst. 2: 104 (1821).
99. BRASSICACEAE Lindl. Nat. Syst. Ed. 2, 58 (1836).
    Called Cruciferae by Engler and Prantl.
100. TOVARIACEAE Pax; Engl. & Pr. Nat. Pfl. 3: part 2, 207 (1891).
101. CAPPARIDACEAE Lindl. Nat. Syst. Ed. 2, 61 (1836).
    Cleomeaceae Horan. Tetract. Nat. 31 (1843).
102. RESEDACEAE S. F. Gray, Arr. Brit. Pl. 2: 665 (1821).
    Asterocarpaceae† Kerner, Pflanzenleb. 2: 688 (1891).
103. MORINGACEAE Dumort. Anal. Fam. 43, 48 (1829).
104. SARRACENIACEAE La Pylaie, Mem. Soc. Linn. Par. 6: 379 (1827).§
105. NEPENTHACEAE Lindl. Nat. Syst. Ed. 2, 204 (1836).
106. DROSERACEAE S. F. Gray, Arr. Brit. Pl. 2: 664 (1821).
    Dionaeaceae Lindl. Nat. Syst. Ed. 2, 14 (1836).
    Dionaceae* Dumort. Bull. Ac. Brux. 4: 447 (1838).
107. PODOSTEMACEAE Lindl. Nat. Syst. Ed. 2, 190 (1836).
    Philocrenaceae‡ Bongard, Mem. Ac. St. Pet., Ser. 6, 1: 72 (1835).§
    Tristichaceae Kerner, Pflanzenleb. 2: 673 (1891).
    Weddellinaceae Kerner, Pflanzenleb. 2: 673 (1891).
    Hydrostachydaceae Kerner, Pflanzenleb. 2: 673 (1891).
108. SEDACEAE Neck. Act. Ac. Theod. Palat. 2: 487 (1770).
    Crassulaceae DC. Fl. Franç. 4: 382 (1805).
109. CEPHALOTACEAE Lindl. Key (1835) §
110. ESCALLONIACEAE Dumort. Anal. Fam. 35, 37 (1829).
    Ribesiaceae* Reichb. Consp. 160 (1828).
    Saxifragaceae Dumort. Anal. Fam. 36, 38 (1829).
    Hydrangeaceae Dumort. Anal. Fam. 36, 38 (1829).
    Grossulariaceae‡ Dumort. Anal. Fam. 37, 42 (1829).
    Parnassiaceae Dumort. Anal. Fam. 44, 49 (1829).
    Baueraceae Lindl. Nat. Syst. Ed. 1 (1830).
    Brexiaceae Lindl Nat. Syst. Ed. 1 (1830).
    Francoaceae A. Juss. Ann. Sc. Nat. 25: 9 (1832).
    Philadelphaceae Lindl. Nat. Syst. Ed. 2, 47 (1836).

Roussaeaceae† DC. Prodr. 7, part 2: 521 (1839).
Polyosmaceae Blume, Mus. Bot. Lugd. 1: 258 (1850).
Ixerbiaceae Griseb. Grundr. Syst. Bot. 122 (1854).
Rousseaceae (DC.) Griseb. Grundr. Syst. Bot. 123 (1854).
Iteaceae Agardh, Theor. Syst. Pl. 151 (1858).
111. CUNONIACEAE R. Brown, Flind. Voy. App. 3, 548 (1814).
112. MYROTHAMNACEAE Niedenzu; Engl. & Pr. Nat. Pfl. 3: part 2a, 103 (1891)
113. PITTOSPORACEAE Lindl. Nat. Syst. Ed. 2, 31 (1836).
114. ALTINGIACEAE Hayne, Flora, 1: 172 (1830).
Ambraceae* Reichb. Consp. 113 (1828).
Hamamelaceae* Lindl. Nat. Syst. Ed. 2, 48 (1836).
Parrotiaceae Horan. Tetract. Nat. 28 (1843).
Hamamelidaceae Lindl. Veg. Kingd. 784 (1847).
Amamelidaceae Pfeiff. Nomencl. Bot. 1: 129 (1873).
115. BRUNIACEAE R. Brown, Abel Journ. App. 374 (1818).
116. PLATANACEAE Lindl. Nat. Syst. Ed. 2, 187 (1836).
117. ROSACEAE B. Juss. Hort. Trian. (1759).
Agrimoniaceae DC. Fl. Franç. 4: 448 (1805).
Fragariaceae Nest. Potent. 14 (1816).
Spiraeaceae Dumort. Comm. Bot. 59 (1822).
Potentillaceae HBK. Nov. Gen. 6: 215 (1823).
Spireaceae† D. Don. Prodr. Fl. Nepal. 227 (1825).
Hageniaceae Reichb. Consp. 145 (1828).
Amygdalaceae Reichb. Consp. 177 (1828).
Cliffortiaceae Dumort. Anal. Fam. 18 (1829).
Chrysobalanaceae Lindl. Nat. Syst. Ed. 2, 158 (1836).
Sanguisorbaceae Lindl. Veg. Kingd. 561 (1847).
Neilliaceae Miquel, Fl. Ind. Bat. 1: 390 (1855).§
Dryadaceae Frank; Leunis, Synops. Pfl. 2: 160 (1885).
Poteriaceae Frank; Leunis, Synops. Pfl. 2: 173 (1885).
118. CONNARACEAE R. Brown, Exp. Cong. App. 5, 431 (1818).
119. CASSIACEAE Link, Handb. 2: 135 (1831).
Fabaceae‡ Reichb. Consp. 149 (1828).
Sophoraceae Link, Handb. 2: 143 (1831).
Mimosaceae Reichb. Fl. Exc. 437 (1832).
Viciaceae C. Koch, Linnaea 12: 727 (1841).
Caesalpiniaceae Kl. & Grcke. Bot. Erg. Wald. 157 (1862).
Phaseolaceae Pfeiff. Nomencl. Bot. 2: 668 (1874).
Called Leguminosae by Engler and Prantl.
120. GERANIACEAE J. St. Hil. Expos. Fam. 2: 51 (1805).
Vivianiaceae Klotsch, Linnaea 10: 433 (1836).
Vivianaceae† Agardh, Theor. Syst. Pl. 203 (1858).
Ledocarpaceae‡ Kl. & Grcke. Bot. Erg. Wald. 121 (1862).
121. OXALIDACEAE Lindl. Nat. Syst. Ed. 2, 140 (1836).
122. TROPAEOLACEAE Lindl. Veg. Kingd. 366 (1847).

123. LINACEAE Dumort. Comm. Bot. 61 (1822).
HUGONIACEAE Arn.; Wight & Arn. Prodr. 1: 71 (1834).
124. HUMIRIACEAE A. Juss.; A. St. Hil. Fl. Bras. Mer. 2: 87 (1829).§
125. ERYTHROXYLACEAE A. Rich. Pl. Vasc. Cub. 254 (1842).§
126. MALPIGHIACEAE Vent. Tabl. 3: 131 (1799).
HIRAEACEAE Griseb.; Martius, Fl. Bras. 12: 3, 75 (1858).
127. NITRARIACEAE Lindl. Nat. Syst. Ed. 1 (1830).
GUAIACEAE* Reichb. Consp. 200 (1828).
ZYGOPHYLLACEAE Lindl. Nat. Syst. Ed. 2. 133 (1836).
128. CNEORACEAE Engler; Engl. & Pr. Nat. Pfl. 3: part 4, 93 (1890).
129. RUTACEAE Juss. Gen. 296 (1789).
PTELEACEAE Kunth, Ann. Sc. Nat. 2: 354 (1824).
XANTHOXYLACEAE Lindl. Nat. Syst. Ed. 2, 135 (1836).
ZANTHOXYLACEAE† Meisn. Pl. Vasc. Gen. 64 (1837).
CORREACEAE Agardh, Theor. Syst. Pl. 229 (1858).
CITRACEAE Drude, Phanerog. 391 (1879).
BORONIACEAE Kerner, Pflanzenleb. 2: 676 (1891).
130. SIMARUBACEAE DC. Bull. Soc. Philom. 2: 209 (1811).
SURIANACEAE Lindl. Nat. Syst. Ed. 2, 142 (1836).
SIMABACEAE* Horan. Tetract. Nat. 31 (1843).
131. BURSERACEAE Kunth, Ann. Sc. Nat. 2: 346 (1824).
BALSAMEACEAE Dumort. Anal. Fam. 36, 41 (1829).
BURSERIACEAE* G. Don, Gen. Syst. 2: 79 (1832).
AMYRIDACEAE Lindl. Nat. Syst. Ed. 2, 165 (1836).
132. MELIACEAE Vent. Tabl. 3: 159 (1799).
CEDRELACEAE A. Juss. Mem. Mus. 19: 213, 247 (1830).
133. TRIGONIACEAE Martius, Consp. 51 (1835).
134. VOCHYSIACEAE Mart. & Zucc. Nov. Gen. 1: 123 (1824).
ERISMACEAE Dumort. Anal. Fam. 41 (1829).
VOCHYACEAE* Lindl. Nat. Syst. Ed. 1 (1830).
135. TREMANDRACEAE Dumort. Anal. Fam. 43 (1829).
136. POLYGALACEAE Reichb. Consp. 120 (1828).
KRAMERIACEAE Dumort. Anal. Fam. 20, 23 (1829).
137. CHAILLETIACEAE DC. Prodr. 2: 57 (1825).
138. EUPHORBIACEAE J. St. Hil. Expos. Fam. 276 (1805).
RICINACEAE Nor.; Dup.-Thouars, Veg. Il. Afr. 28 (1807).§
HURACEAE Dumort. Anal. Fam. 45 (1829).
SCEPACEAE Lindl. Nat. Syst. Ed. 2, 171 (1836).
TREWIACEAE Lindl. Nat. Syst. Ed. 2, 174 (1836).
STILAGINACEAE Lindl. Nat. Syst. Ed. 2, 179 (1836).
ANTIDESMACEAE Horan. Tetract. Nat. 25 (1843).
BENNETTIACEAE† Schnizl. Icon. *t. 172* (1843).§
BERTYACEAE Agardh, Theor. Syst. Pl. 190 (1858).
PERACEAE Klotsch, Tricocc. 12 (1860) §
ACALYPHACEAE Klotsch, Tricocc. 12 (1860).§

Phyllanthaceae Klotsch, Tricocc. 12 (1860).§
Daphniphyllaceae Muell.-Arg.; DC. Prodr. 16: part 1, 1 (1869)
Tithymalaceae‡ Kerner, Pflanzenleb. 2: 674 (1891).
139. CALLITRICHACEAE Lindl. Nat. Syst. Ed. 2, 191 (1836).
Stellariaceae‡ Mac M. Metasp. Minn. Val. 344 (1892).
140. EMPETRACEAE Dumort. Fl. Belg. 106 (1827).§
141. CORIARIACEAE Dumort. Anal. Fam. 87 (1829).
142. BUXACEAE Dumort. Comm. Bot. 54 (1822).
143. LIMNANTHACEAE Lindl. Nat. Syst. Ed. 2, 142 (1836).
144. SPONDIACEAE Kunth, Ann. Sc. Nat. 2: 362 (1824).
Terebintaceae†‡ Juss. Gen. 368 (1789).
Terebinthaceae‡ DC. Fl. Franç. 4: 613 (1805).
Anacardiaceae Lindl. Nat. Syst. Ed. 1 (1830).
145. CYRILLACEAE Lindl. Veg. Kingd. 445 (1847).
146. ILICACEAE Lowe, Fl. Madeir. 2: 11 (1868).
Aquifoliaceae‡ DC. Prodr. 2: 11 (1825).
147. CELASTRACEAE Lindl. Nat. Syst. Ed. 2, 119 (1836).
148. HIPPOCRATEACEAE HBK. Nov. Gen. 5: 136 (1821).
149. STACKHOUSIACEAE Lindl. Nat. Syst. Ed. 2, 118 (1836).
150. ICACINACEAE Miers, Ann. & Mag. N. H. Ser. 2, 9: 218 (1852).
Phytocrenaceae Miers; Lindl. Veg. Kingd. Ed. 3, 271a (1853).
Barreriaceae‡ Martius, Consp. 41 (1835).
151. STAPHYLEACEAE DC. Prodr. 2: 2 (1825).
Staphylaceae* Reichb. Consp. 200 (1828).
Ochranthaceae‡ Lindl. Nat. Syst. Ed. 2, 78 (1836).
152. ACERACEAE J. St. Hil. Expos. Fam. 2: 15 (1805).
Acerinaceae* Kl. & Grcke. Bot. Erg. Wald. 124 (1862).
153. AESCULACEAE Lindl.; Orb. Dict. 1: 155 (1841).
Called Hippocastanaceae by Engler and Prantl.
154. SAPINDACEAE R. Brown, Exp. Congo, App. 5, 427 (1818).
Paulliniaceae HBK. Nov. Gen. 5: 99 (1821).
Dodonaeaceae HBK. Nov. Gen. 5: 130 (1821).
155. MELIANTHACEAE Endl. Gen. Supp. 5: 80 (1850).
156. IMPATIENTACEAE (nom. nov.).
Balsaminaceae‡ Dumort. Anal. Fam. 46 (1829).
157. SABIACEAE Blume, Mus. Bot. Lugd. 1: 368 (1851).
Millingtoniaceae‡ Wight & Arn. Prodr. 1: 115 (1834).
Wellingtoniaceae†‡ Meisn. Pl. Vasc. Gen. Comm. 207 (1840).
158. FRANGULACEAE DC. Fl. Franç. 4: 619 (1805).
Rhamneaceae* D. Don, Prodr. Fl. Nepal. 188 (1825).
Rhamnaceae Dumort. Fl. Belg. 102 (1827).§
Gouaniaceae Reichb. Consp. 145 (1828).
Phylicaceae Agardh, Theor. Syst. Pl. 186 (1858).
159. LEEACEAE DC. Prodr. 1: 635 (1824).
Vitaceae Lindl. Nat. Syst. Ed. 2, 30 (1836).

160. ARISTOTELIACEAE Dumort. Anal. Fam. 37, 41 (1829).
    Elaeocarpaceae Lindl. Nat. Syst. Ed. 2, 97 (1836).
161. TILIACEAE Juss. Gen. 289 (1789).
    Sparmanniaceae Agardh, Theor. Syst. Pl. 260 (1858).
162. MALVACEAE Neck. Act. Ac. Theod. Palat. 2: 488 (1770).
    Goetheaceae Reichb. Consp. 204 (1828).
    Sidaceae Dumort. Anal. Fam. 46 (1829).
    Malvaviscaceae Presl, Reliq. Haenk. 2: 1, 135 (1831).§
    Gossypiaceae Kerner, Pflanzenleb. 2: 681 (1891).
163. BOMBACACEAE Schum.; Engl. & Pr. Nat. Pfl. 3: part 6, 53 (1890).
    Bombaceae* HBK. Nov. Gen. 5: 294 (1821).
164. BUETTNERIACEAE (R. Brown) HBK. Nov. Gen. 5: 309 (1821).
    Buttneriaceae† R. Brown, Flind. Voy. App. 3, 540 (1814).
    Sterculiaceae HBK. Nov. Gen. 5: 310 (1821).
    Hermanniaceae HBK. Nov. Gen. 5: 312 (1821).
    Dombeyaceae HBK. Nov. Gen. 5: 313 (1821).
    Byttneriaceae† DC. Prodr. 1: 481 (1824).
    Buettneraceae* Trattin. Gen. Nov. (1825).
    Triphaceae*‡ Reichb. Handb. 291 (1837).§
165. DILLENIACEAE R. Brown, Flind. Voy. App. 3, 541 (1814).
    Delimaceae‡ DC. Syst. 1: 396, 397 (1818).
166. EUCRYPHIACEAE Gay, Bot. Zeit. 6: 130 (1848).
167. OCHNACEAE DC. Ann. Mus. 17: 410 (1811).
    Ochneaceae* D. Don, Prodr. Fl. Nepal. 224 (1825).
    Sauvagesiaceae Dumort. Anal. Fam. 44, 49, (1829).
168. CARYOCARACEAE Szysz.; Engl. & Pr. Nat. Pfl. 3: part 6, 153 (1893).
    Rhizobolaceae‡ Lindl. Nat. Syst. Ed. 2, 76 (1836).
169. MARCGRAVIACEAE Choisy; DC. Prodr. 1: 565 (1824).
    Margraviaceae† Dumort. Anal. Fam. 43 (1829).
    Marcgraaviaceae† Lindl. Nat. Syst. Ed. 1 (1830).
    Noranteaceae Martius, Consp. 61 (1835).
170. QUIINACEAE Engler; Martius, Fl. Bras. 12, 1: 477 (1888).
    Quiineaceae* Choisy, Descr. Gutt. Ind. 12 (——).§
171. SCHIZOCHLAENACEAE (nom. nov.).
    Called Chlaenaceae by Engler and Prantl.
172. THEACEAE DC. Prodr. 1: 529 (1824).
    Ternstroemiaceae‡ R. Brown, Abel Journ. App. 378 (1818).
    Laplaceae*‡ DC. Prodr. 1: 526 (1824).
    Ternstromiaceae†‡ Agardh, Cl. Pl. 18 (1825).
    Camelliaceae Dumort. Anal. Fam. 43, 47 (1829).
173. STACHYURACEAE Gilg; Engl. & Pr. Nat. Pfl. 3: part 6, 192 (1893).
174. SYMPHONIACEAE Presl, Symb. Bot. 1: 71 (1832).
    Clusiaceae Lindl. Nat. Syst. Ed. 2, 74 (1836).
    Hypericaceae Lindl. Nat. Syst. Ed. 2, 77 (1836).
    Cambogeaceae*‡ Horan. Tetract. Nat. 32 (1843).

Called GUTTIFERAE by Engler and Prantl.

175. SHOREACEAE Roxb.; Wall. Catal. *n. 4405* (1832).§
  DIPTERACEAE* Lindl. Nat. Syst. Ed. 2, 98 (1836).
  LOPHIRACEAE Endl. Gen. 1014 (1840).
  DIPTEROCARPACEAE Eichl. Bluethendiagr. **2**: 262 (1878).
176. ELATINACEAE Lindl. Nat. Syst. Ed. 2, 88 (1836).
177. FOUQUIERACEAE DC. Prodr. **3**: 349 (1828).
  FOUQUIERIACEAE* Dumort. Anal. Fam 27 (1829).
  REAUMURIACEAE G. Don, Gen. Syst. **3**: 155 (1834).
  TAMARICACEAE Lindl. Nat. Syst. Ed. 2, 126 (1836).
  TAMARISCACEAE† Lowe, Fl. Madeir. 46 (1868)
178. FRANKENIACEAE S. F. Gray, Arr. Brit. Pl. **2**: 663 (1821).
179. CISTACEAE Lindl. Nat. Syst. Ed. 2, 91 (1836).
180. BIXACEAE Reichb. Consp. 190 (1828).
181. CANELLACEAE Martius, Nov. Gen. **3**: 168 (1829).
182. VIOLACEAE DC. Fl. Franç. **4**: 801 (1805).
  LEONEACEAE† A. DC. Prodr. **8**: 668 (1844).
  LEONIACEAE (A. DC.) Agardh, Theor. Syst. Pl. 142 (1858).
183. SAMYDACEAE Dumort. Anal. Fam. 16, 18 (1829).
  PAROPSIACEAE Dumort. Anal. Fam. 37, 42 (1829).
  FLACURTIACEAE† Dumort. Anal. Fam. 44, 49 (1829).
  FLACOURTIACEAE (Dumort.) Lindl. Nat. Syst. Ed. 1 (1830).
  KIGGELARIACEAE Link, Handb. **2**: 221 (1831).
  BLACKWELLIACEAE‡ Schultz, Nat. Syst. Pfl. 444 (1832).
  PATRISIACEAE Martius, Consp. 58 (1835).
  HOMALIACEAE Lindl. Nat. Syst. Ed. 2, 55 (1836).
  PANGIACEAE Lindl. Nat. Syst. Ed. 2, 70 (1836).
184. TURNERACEAE HBK. Nov. Gen. **6**: 123 (1823).
185. MALESHERBIACEAE D. Don, Edinb. N. Phil. Journ. **2**: 320, 321 (1827).
186. PASSIFLORACEAE Dumort. Anal. Fam. 37, 42 (1829).
  MODECCACEAE‡ Agardh, Theor. Syst. Pl. 386 (1858).
187. CARICACEAE Dumort. Anal. Fam. 37, 42 (1829).
  PAPAYACEAE‡ Blume, Batav. Cour. (1823).§
188. LOASACEAE Reichb. Consp. 160 (1828).
  CEVALLIACEAE Griseb. Grundr. Syst. Bot. 136 (1854).
189. BEGONIACEAE R. Brown, Exp. Cong. App. 5, 464 (1818).
190. DATISCACEAE Dumort. Anal. Fam. 13, 14 (1829).
191. OPUNTIACEAE HBK. Nov. Gen. **6**: 64 (1823).
  CACTACEAE‡ Lindl. Nat. Syst. Ed. 2, 53 (1836).
  PERESKIACEAE† Salm-Dyck, Otto & Dietr. Gartenz. 61 (1840).§
  LEUCHTENBERGIACEAE Salm-Dyck, Otto's Gartenz. 188 (1854) §
192. GEISSOLOMACEAE Sonder, Linnæa **23**: 105 (1850).
193 PENAEACEAE Sweet, Hort. Brit. 488 (1826).
194. OLINIACEAE Presl, Abh. Boehm. Ges. Folge 5, 3: 467 (1845).§
  OLINACEAE* Kl. & Grcke. Bot. Erg. Wald. 152 (1862).

195. DAPHNACEAE J. St. Hil. Expos. Fam. 1: 180 (1805).
    - Thymeleaceae† Reichb. Consp. 82 (1828).
    - Aquilariaceae Dumort. Anal. Fam. 15, 18 (1829).
    - Thymelaceae* Lindl. Nat. Syst. Ed. 1 (1830).§
    - Thymelaeaceae (Reichb.) Reichb. Fl. Exc. 164 (1831).
196. ELAEAGNACEAE Lindl. Nat. Syst. Ed. 2, 194 (1836).
197. LYTHRACEAE Lindl. Nat. Syst. Ed. 2, 100 (1836).
    - Lythrariaceae* Dumort. Anal. Fam. 36, 39 (1829).
    - Ammanniaceae Horan. Tetract. Nat. 29 (1843).
    - Cupheaceae Kerner, Pflanzenleb. 2: 698 (1891),
    - Lagerstroemiaceae Kerner, Pflanzenleb. 2: 698 (1891).
198. HENSLOWIACEAE (Lindl.) Martius, Consp. 14 (1835).
    - Hensloviaceae† Lindl. Bot. Reg. 20: *t. 1686* (1834).
    - Crypteroniaceae A. DC. Prodr. 16, part 2: 677 (1868).
    - Blattiaceae Niedenzu; Engl. & Pr. Nat. Pfl. 3: part 7, 16 (1892).
199. PUNICACEAE Horan. Tetract. Nat. 30 (1843).
200. NAPOLEONACEAE Dumort. Anal. Fam. 28, 29 (1829).
    - Belvisiaceae‡ Lindl. Nat. Syst. Ed. 1 (1830).
    - Lecythidaceae Lindl. Nat. Syst. Ed. 2, 523 (1836).
    - Barringtoniaceae Lindl. Veg. Kingd. 754 (1847).
201. RHIZOPHORACEAE Lindl. Nat. Syst. Ed. 2, 40 (1836).
202. MYRTACEAE R. Brown, Flind. Voy. App. 3, 546 (1814).
    - Myrteaceae* Nees, Nov. Act. Leop. 11, 1: 113 (1823).
    - Chamaelauciaceae Lindl. Veg. Kingd. 721 (1847).
    - Leptospermaceae Kerner, Pflanzenleb. 2: 691 (1891).
203. TERMINALIACEAE J. St. Hil. Expos. Fam. 1: 178 (1805).
    - Combretaceae R. Brown, Prodr. 1: 351 (1810).
204. BLAKEACEAE Reichb. Consp. 174 (1828).
    - Melastomaceae* R. Brown, Exp. Cong. App. 5, 434 (1818).
    - Rhexiaceae Martius, Consp. 64 (1835).
    - Memecylaceae* Lindl. Nat. Syst. Ed. 2, 40 (1836).
    - Mouririaceae Gardn. Hook. Journ. Bot. 2: 22 (1840).
    - Miconiaceae‡ C. Koch, Berl. Gartenz. 241 (1857).§
    - Melastomataceae Krasser; Engl. & Pr. Nat. Pfl. 3: part 7, 130 (1893).
    - Charianthaceae Kerner, Pflanzenleb. 2: 697 (1891).
205. EPILOBIACEAE DC. Prodr. 3: 35 (1828).
    - Onagraceae Dumort. Anal. Fam. 36, 39 (1829).
    - Fuchsiaceae Dumort. Anal. Fam. 39 (1829).
    - Circaeaceae Lindl. Nat. Syst. Ed. 1 (1830).
    - Jussieuaceae Drude, Phanerog. 385 (1879).
    - Oenotheraceae Drude, Phanerog. 385 (1879).
206. TRAPACEAE Dumort. Fl. Belg. 90 (1827).§
    - Called Hydrocaryaceae by Engler and Prantl.
207. GUNNERACEAE Endl. Gen. 285 (1837).
    - Haloragaceae*† Horan. Tetract. Nat. 25 (1843).
    - Halorrhagidaceae Kl. & Grcke. Bot. Erg. Wald. 151 (1852).
    - Hippuridaceae Sag. & Schn. Fl. Carp. Cent. 2: 23, 468 (1891).

208. HEDERACEAE Linn. Ord. Nat. (1764).
Araliaceae Vent. Tabl. 3: 2 (1799).
Panaceae* Reichb. Consp 144 (1828).
Helwingiaceae Morren & Dec. Bull. Ac. Brux. 169 (1836).
Helvingiaceae† Agardh, Theor. Syst. Pl. 310 (1858).

209. AMMIACEAE Presl, Delic. Prag. 1 (1822).§
Sileraceae Presl, Delic. Prag. 1 (1822).§
Bolaceae* Reichb.; Moessl. Handb. 1: 45 (1827).§
Apiaceae Lindl. Nat. Syst. Ed. 2, 21 (1836).
Called Umbelliferae by Engler and Prantl.

210. NYSSACEAE Dumort. Anal. Fam. 13 (1829).
Cornaceae Link, Handb. 2: 2 (1831).
Garryaceae Lindl. Bot. Reg. 20: *t. 1686* (1834).
Alangiaceae Lindl. Nat. Syst. Ed. 2, 39 (1836).
Aucubaceae Agardh, Theor. Syst. Pl. 303 (1858).

211. CLETHRACEAE Klotzsch, Linnæa, 24: 12 (1851).

212. PIROLACEAE (Agardh) Drude; Engl. & Pr. Nat. Pfl. 4, part 1: 3 (1889).
Pyrolaceae† Agardh, Cl. Pl. 18 (1825).
Monotropaceae Lindl. Nat. Syst. Ed. 2, 219 (1836).
Pyroleaceae*† Brongn. Enum. Gen. 72 (1843).
Hypopityaceae‡ Kl. & Grcke. Bot. Erg. Wald. 99 (1862).

213. LENNOACEAE Solms-Laub. Abh. Nat. Ges. Halle, 11: 174 (1870).

214. ERICACEAE DC. Fl. Franç. 3: 675 (1805).
Rhodoraceae‡ Vent. Tabl. 2: 449 (1799).
Vaccinaceae* Lindl. Nat. Syst. Ed. 2, 221 (1836).
Vacciniaceae Lindl. Veg. Kingd. 757 (1847).
Menziesiaceae Klotzsch, Linnæa 24: 11 (1851).
Siphonandraceae Klotzsch, Linnæa, 24: 11, 13 (1851).
Arbutaceae Kerner, Pflanzenleb. 2: 671 (1891).
Oxycoccaceae‡ Kerner, Pflanzenleb. 2: 713 (1891).

215. STYPHELIACEAE Reichb. Consp. 127 (1828).
Richeaceae Reichb. Consp. 128 (1828).
Sprengeliaceae Reichb. Consp. 128 (1828).
Lysinemaceae Reichb. Consp. 128 (1828).
Epacridaceae Lindl. Nat. Syst. Ed. 2, 222 (1836).

216. DIAPENSIACEAE Link, Handb. 1: 595 (1829).
Galaceae* DC. Prodr. 7, part 2: 776 (1839).

217. ARDISIACEAE Juss. Ann. Mus. 15: 350 (1810).
Theophrasteaceae* D. Don; Lindl. Bot. Reg. 21: *t. 1764* (1835).
Myrsinaceae Lindl. Nat. Syst. Ed. 2, 224 (1836).
Myrsineaceae G. Don, Gen. Syst. 4: 7 (1837).
Aegiceraceae* A. DC. Prodr. 8: 141 (1844).

218. PRIMULACEAE Vent. Tabl. 2: 285 (1799).
Lysimachiaceae Reichb. Consp. 127 (1828).
Androsaceae* Reichb. Consp. 128 (1828).
Hottoniaceae Reichb. Fl. Exc. 398 (1831).

219. ARMERIACEAE Dumort. Comm. Bot. 61 (1822).

Plumbaginaceae Lindl. Nat. Syst. Ed. 2, 269 (1836).
Staticaceae Trautv. Bull. Ac. Pet. 14: 250 (1856).
220. BUMELIACEAE (nom. nov.)
Sapotaceae‡ Reichb. Consp. 135 (1828).
221. DIOSPYRACEAE Drude, Phanerog. 377 (1879).
Ebenaceae‡ Vent. Tabl. 2: 443 (1779).
222. SYMPLOCACEAE Miers; Lindl. Veg. Kingd. Ed. 3, 593 (1853).
223. HALESIACEAE Link, Hanbd. 1: 667 (1829).
Styraceae* Reichb.; Moessl. Hanbd. 1: xlii (1827).§
Styracaceae A. DC. Prodr. 8: 244 (1844).
224. OLEACEAE Lindl. Nat. Syst. Ed. 1 (1830).
Lilaceae Vent. Tabl. 2: 306 (1799).
Jasminaceae Lindl. Nat. Syst. Ed. 2, 308 (1836).
Bolivariaceae Griseb. Gentian. 20 (1836).§
Jasmineaceae* G. Don, Gen. Syst. 4: 58 (1837).
Syringaceae Horan. Tetract. Nat. 27 (1843).
225. SALVADORACEAE Lindl. Nat. Syst. Ed. 2, 269 (1836).
Azimaceae Wight & Gardn. Calcutta Journ. 6: 52 (1845).§
226. SPIGELIACEAE Martius, Nov. Gen. 2, 2: 132 (1827).
Strychneaceae* Blume, Bijdr. n. 16: 1018 (1826).§
Loganiaceae Dumort. Anal. Fam. 21, 26 (1829).
Potaliaceae Dumort. Anal. Fam. 21, 26 (1829).
Strychnaceae Link, Handb. 1: 439 (1829).
Fagraeaceae Meisn Pl. Vasc. Gen. 167 (1839).
227. GENTIANACEAE Dumort. Anal. Fam. 20, 25 (1829).
Menyanthaceae G. Don, Gen. Syst. 4: 167 (1837).
Erythraeaceae Griseb. Gen. et Sp. Gent. 69 (1839).§
Chironiaceae Horan. Tetract. Nat. 27 (1843).
Exaceae* Benth. & Hook. Gen. Pl. 2: 800 (1876).
228. APOCYNACEAE Lindl. Nat. Syst. Ed. 2. 299 (1836).
Vincaceae Horan. Tetract. Nat. 27 (1843).
229. STAPELIACEAE Reichb.; Moessl. Handb. 1: 40 (1827).§
Asclepiadaceae Lindl. Nat. Syst. Ed. 2, 302 (1836).
Hoyaceae G. Don, Gen. Syst. 4: 107 (1837).
230. CONVOLVULACEAE Vent. Tabl. 2: 394 (1799).
Dichondraceae Dumort. Anal. Fam. 20, 24 (1829).
Cuscutaceae Dumort. Anal. Fam. 20, 25 (1829).
Poranaceae Agardh. Theor. Syst. Pl. 364 (1858).
231. POLEMONIACEAE DC. Fl. Franç. 3: 645 (1805).
Polemonaceae* Vent. Tabl. 2: 398 (1799).
Cobeaceae† D. Don, Edinb. Phil. Journ. 10: 111 (1824).
Cobaeaceae Dumort. Anal. Fam. 20 (1829).
232. HYDROLEACEAE HBK. Nov. Gen. 3: 125 (1818).
Hydrolaeaceae† Dumort. Anal. Fam. 20, 25 (1829).
Romanzoviaceae† Dumort. Anal. Fam. 26 (1829).
Hydrophyllaceae Lindl. Nat. Syst. Ed. 2, 271 (1836).
233. EHRETIACEAE Schrad. Diss. Asperif. 20 (1820).§

- CORDIACEAE Dumort. Anal. Fam. 20, 25 (1829).
- BORAGINACEAE† Lindl. Nat. Syst. Ed. 2, 274 (1836).
- ONOSMACEAE Horan. Tetract. Nat. 28 (1843).
- BORRAGINACEAE (Lindl.) A. Gray, Man. Ed. 2, 319 (1856).

234. VERBENACEAE J. St. Hil. Expos. Fam. 1: 245 (1805).
    - VERBACEAE* Link, Enum. 1: 174 (1821).
    - STILBACEAE Lindl. Nat. Syst. Ed. 2, 280 (1836).
    - PHRYMACEAE Schauer; DC. Prodr. 11: 520 (1847).
    - DURANTACEAE Agardh, Theor. Syst. Pl. 295 (1858).
    - PETRAEACEAE Agardh, Theor. Syst. Pl. 364 (1858).
235. LAMIACEAE Lindl. Nat. Syst. Ed. 2, 275 (1836).
    - NEPETACEAE Horan. Tetract. Nat. 28 (1843).
    - SALVIACEAE Drude, Phanerog. 374 (1879).
    - Called LABIATAE by Engler and Prantl.
236. NOLANACEAE Dumort. Anal. Fam. 20, 24 (1829).
237. SOLANACEAE Pers Ench. 1: 214 (1805).
    - RETZIACEAE Bartl. Ord. Nat. 192 (1830).
    - CESTRACEAE Lindl. Nat. Syst. Ed. 2, 296 (1836).
    - SCLEROPHYLACEAE* Miers, Lond. Journ. Bot. 7: 57 (1848).
    - ATROPACEAE Miers, Ann. & Mag. N. H. Ser. 2, 3: 163 (1849).
238. RHINANTHACEAE J. St. Hil. Expos. Fam. 1: 227 (1805).
    - MELAMPYRACEAE Dumort. Fl. Belg. 32 (1827).§
    - LINDERNIACEAE Reichb. Consp. 123 (1828).
    - CAPRARIACEAE Reichb. Consp. 124 (1828).
    - HALLERIACEAE Link, Handb. 1: 506 (1829).
    - SCOPARIACEAE Link, Handb. 1: 822 (1829).
    - ARAGOACEAE D. Don, Edinb. N. Phil. Journ. 19: 113 (1835).
    - SIBTHORPIACEAE D. Don, Edinb. N. Phil. Journ. 19: 114 (1835).
    - SELAGINACEAE Lindl. Nat. Syst. Ed. 2, 279 (1836).
    - SCROPHULARIACEAE Lindl. Nat. Syst. Ed. 2, 288 (1836).
    - SCROFULARIACEAE† Horan. Tetract. Nat. 27 (1843).
    - VERONICACEAE Agardh, Theor. Syst. Pl. 392 (1858).
    - ERINACEAE Pfeiff. Nomencl. Bot. 1: 1236 (1874).
239. PINGUICULACEAE Dumort. Anal. Fam. 19, 23 (1829).
    - UTRICULARIACEAE Dumort. Anal. Fam. 19, 23 (1829).
    - LENTIBULARIACEAE‡ Lindl. Veg. Kingd. 686 (1847).
240. OROBANCHACEAE Lindl. Nat. Syst. Ed. 2, 287 (1836).
    - LATHRAEACEAE Walp. Ann. Bot. 3: 204 (1853).
241. CYRTANDRACEAE Jack, Linn. Trans. 14, 1: 23 (1823).
    - GESSNERIACEAE† Nees, Ann. Sc. Nat. 6: 295 (1825).
    - GESNERIACEAE (Nees) Dumort Anal. Fam. 28, 30 (1829).
    - GESNERACEAE* Lindl. Nat. Syst. Ed. 2, 283, 286 (1836).
    - RAMONDIACEAE Gren. & Godr. Fl. Franc. 2: 506 (1850.)§
242. COLUMELLIACEAE Lindl. Nat. Syst. Ed. 1 (1830).
243. BIGNONIACEAE Pers. Ench. 2: 168 (1807)
    - CRESCENTIACEAE Dumort. Anal. Fam. 20, 24 (1829).
244. MARTYNIACEAE Link, Handb. 1: 504 (1829).

Pedaliaceae Lindl. Nat. Syst. Ed. 2, 281 (1836).
Sesamaceae Drude, Phanerog. 373 (1879).
245. GLOBULARIACEAE Dumort. Anal. Fam. 19, 21 (1829).
Globulaceae* Dumort. Comm. Bot. 55 (1822).
246. ACANTHACEAE J. St. Hil. Expos. Fam. 1: 236 (1805).
247. MYOPORACEAE Lindl. Nat. Syst. Ed. 2, 279 (1836).
Bontiaceae Horan. Tetract. Nat. 27 (1843).
248. PLANTAGINACEAE Lindl. Nat. Syst. Ed. 2, 267 (1836).
249. RUBIACEAE B. Juss. Hort. Trian. (1759).
Coffeaceae Batsch, Tab. Affin. 233 (1802).§
Cinchonaceae DC. Ann. Mus. 9: 217 (1807).
Guettardaceae DC. Ann. Mus. 9: 217 (1807).
Gardeniaceae HBK. Nov. Gen. 3: 407 (1818).
Hameliaceae HBK. Nov. Gen. 3: 413 (1818).
Psychotriaceae Cham. & Schlecht. Linnaea 4: 4 (1829).
Operculariaceae Dumort. Anal. Fam. 29, 32 (1829).
Lygodysodeaceae†‡ Bartl. Ord. Nat. 123, 207 (1830).
Lygodysiaceae*†‡ Martius, Consp. 31 (1835).
Galiaceae Lindl. Nat. Syst. Ed. 2, 249 (1836).
Naucleaceae Meisn. Pl. Vasc. Gen. 157 (1838).
Morindaceae Schimp. Paleont. Veg. 2: 874 (1872).
250. VIBURNACEAE Dumort. Comm. Bot. 56 (1822).
Caprifoliaceae‡ Vent. Tabl. 2: 593 (1799).
Linneaceae† Dumort. Fl. Belg. 55 (1827).§
Linnaeaceae Dumort. Anal. Fam. 33 (1829).
Loniceraceae Drude, Phanerog. 370 (1879).
Sambucaceae Kerner, Pflanzenleb. 2: 711 (1891).
251. ADOXACEAE Fritsch; Engl. & Pr. Nat. Pfl. 4, part 4: 170 (1891).
252. VALERIANACEAE Batsch, Tab. Affin. 227 (1802).§
253. MORINACEAE Dumort. Anal. Fam. 32 (1829).
Dipsaceae* B. Juss. Hort. Trian. (1759).
Dipsacaceae Lindl. Veg. Kingd. 699 (1847).
254. CUCURBITACEAE B. Juss. Hort. Trian. (1759).
Zanoniaceae Blume, Bijdr. 15: 936 (1826).
Zannoniaceae Dumort. Anal. Fam. 103 (1829).
255. CAMPANULACEAE Juss. Gen. 163 (1789).
Lobeliaceae Dumort. Comm. Bot. 57 (1822).
Sphenocleaceae Martius, Consp. 31 (1835).
Delisseaceae Presl, Prodr. Mon. Lobel. 46 (1836).
Cyphiaceae A. DC. Prodr. 7, part 2: 497 (1839).
Nemacladaceae Nutt. Amer. Phil. Trans. N. Ser. 8: 254 (1843).
Cyphocarpaceae Miers, Lond. Journ. Bot. 7: 61 (1848).
256. BRUNONIACEAE Reichb. Consp. 91 (1828).
Goodeniaceae Dumort. Anal. Fam. 28, 30 (1829).
Scaevolaceae Lindl. Nat. Syst. Ed. 2, 242 (1836).
Goodenoughiaceae† Schum.; Martius, Fl. Bras. 3, part 3: 161 (1894).
257. CANDOLLEACEAE Schoenl.; Engl. & Pr. Nat. Pfl. 4, part 5: 79 (1889).

Stylidiaceae ‡ Lindl. Nat. Syst. Ed. 2, 240 (1836).

258. CALYCERACEAE Lindl. Nat. Syst. Ed. 2, 251 (1836).

259. CARDUACEAE Neck. Act. Ac. Theod. Palat. **2**: 465 (1770).
Cichoraceae * B. Juss. Hort. Trian. (1759).
Chicoraceae * † Neck. Act. Ac. Theod. Palat. **2**: 463 (1770).
Gundeliaceae DC. Ann. Mus. **16**: 153 (1810).
Vernoniaceae HBK. Nov. Gen. **4**: 39 (1820).
Inulaceae Presl, Delic. Prag. **1** (1822).§
Jacobaceae * ‡ Dumort. Fl. Belg. 65 (1827).§
Grindeliaceae Reichb. Consp. 107 (1828).
Psiadiaceae Reichb. Consp. 107 (1828).
Calendulaceae Reichb. Consp. 112 (1828).
Ambrosiaceae Reichb. Consp. 112 (1828).
Ivaceae Reichb. Consp. 112 (1828).
Cynaraceae Dumort. Anal. Fam. 32 (1829).
Acarnaceae ‡ Link, Handb. **1**: 684 (1829).
Eupatoriaceae Link, Handb. **1**: 729 (1829).
Partheniaceae Link, Handb. **1**: 816 (1829).
Hieraceae* D. Don, Edinb. N. Phil. Journ. **6**: 306 (1829).
Taraxaceae* D. Don, Edinb. N. Phil. Journ. **6**: 307 (1829).
Cichoriaceae Reichb. Fl. Exc. 248 (1831).
Mutisiaceae Lessing, Syn. Compos. 92 (1832).
Nassauviaceae Lessing, Syn. Compos. 396 (1832).
Asteraceae Lindl. Nat. Syst. Ed. 2, 251, 253 (1836).
Nassaviaceae† Endl. Gen. Suppl. **1**: 1386 (1841).
Evaceae* Schultz-Bip.; Walp. Repert. **2**: 955 (1843).
Cassiniaceae Schultz-Bip. Flora, **1**: 129 (1852).
Centaureaceae Pfeiff. Nomencl. Bot. **1**: 646 (1873).
Helianthaceae Pfeiff. Nomencl. Bot. **1**: 1579 (1874).
Lactucaceae Drude, Phanerog. 369 (1879).
Called Compositae by Engler and Prantl.

NOTES ON A FEW OF THESE NAMES.

15. ELODEACEAE. *Elodea* Michx. is known as *Udora* Nutt. Hence this family bocomes VALLISNERIACEAE Dumort. Anal. Fam. 54, 55 (1829).

94. CALYCANTHACEAE. *Calycanthus* L. should be called *Buettneria* Duham. (see Kearney, Bull. Torr. Club, **21**: 173). As this family contains but one genus, it must be called BUETTNERIACEAE (nom. nov.).

164. BUETTNERIACEAE. The name *Buettneria* Loefl. being no longer tenable, this family should be called STERCULIACEAE HBK. Nov. Gen. **5**: 310 (1821).

A Revision of the North American species of the genus Cracca.

By Anna Murray Vail.

The genus Cracca was established by Linnaeus first in Fl. Zey. 139–141 (1747) and then in Sp. Pl. 752 (1753), the genus being based on *Cracca Virginiana.* In the Sp. Pl. Ed. 2, 1062 (1763) it was *Galega Virginiana*, and after that the synonymy becomes more and more complicated and names for the genus appeared in quick succession among which are: *Colinil* Adans. 1763; *Needhamia* Scop. 1777; *Brissonia* Neck. 1790; *Reinera* Moench, 1802; and finally *Tephrosia* Pers. 1807, under which all the Linnaean species of *Cracca* have been described until 1891, when Kuntze in Rev. Gen. Pl. 173 transferred them all to the original generic title.

Bentham in Oerst. Kjoeb. Vidensk. Meddel, 8 (1853) established a genus *Cracca* based on a West Indian species, *Galega Caribaea*, Jacq. Am. 212, *t. 125* (1781). The six known species of which genus have been transferred by Kuntze, Rev. Gen. Pl. 164 to the genus *Brittonamra.*

Bentham and Hooker in 1867 gave the number of the species of *Tephrosia* as 90, of which some 16 are ascribed to Africa and America. Taubert, in Engler & Prantl Nat. Pfl. part **101**: 269 (1894), gives 120 as the total of species, ascribing few to America. The following revision is an attempt to clearly describe especially the rather difficult Southern State species. As far as is known twelve species are native within the boundaries of the United States and two *C. purpurea* and *C. cinerea* are cosmopolitan plants, the latter known in North America only from ballast ground in Alabama. The Mexican and tropical American species are as yet imperfectly known and are more numerous than it is supposed.*

The genus is accepted as described by Bentham and Hooker, under *Tephrosia.*

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* The following species appears to be undescribed:

Cracca Schottii n. sp.

Perennial from a somewhat woody base, more or less cinereous or silvery-strigose throughout. Stems branching, angled, 3 dm. or more high, erect or decumbent. stipules 4–7 mm. long, subulate, persisting; petioles 1–25 cm. long; leaves 4–7 cm. long, obovate-oblong in outline; leaflets 5–7, obovate or obovate-oblong, 1–2.5 cm. long, 5–15 mm. wide, retuse, minutely apiculate, strigillose above, silvery or cinereous-

ARTIFICIAL KEY TO THE NORTH AMERICAN SPECIES.

Flowers few or crowded in oblong panicles or racemes at the summit of the simple or branched stems (somewhat elongated and spicate in *C. leiocarpa*).
  Leaflets linear–oblong or elliptical, panicles sessile or short-peduncled.
    Stems erect, simple; pubescence on the sessile, crowded panicle silvery; legume cinereous–pubescent or villous . . . . 1. *C. Virginiana.*
    Stems erect, branching; pubescence on the sessile or short-peduncled, crowded panicle tawny; legume rusty or tawny, villous or tomentose. . 2. *C. leucantha.*
    Stem erect, sub-simple or branching; pubescence on the short-peduncled panicle appressed-cinereous; legume yellowish, glabrous . . . 3. *C. leiocarpa.*
  Leaflets obovate or sub-orbicular; panicles long-peduncled.
    Stems prostrate or ascending; legume yellowish, velvety pubescent.
      4. *C. Lindheimeri.*
Flowers fascicled or more or less remote, forming a somewhat spicate long-peduncled inflorescence.
  Stems erect, pilose with mostly spreading rusty hairs; leaflets 9–25 cuneate-oblong. . . . . 5. *C. onobrychoides.*
  Stems decumbent or ascending, pilose with reflexed or spreading rusty hairs; leaflets 5–15, oval or oblong, or in the variety linear-oblong. . . 6. *C. spicata.*
Flowers scattered, single or geminate, forming a slender, elongated, spicate inflorescence, much exceeding the leaves. . . . . 7. *C. purpurea.*
Flowers single or geminate, scattered at the summit of slender ancipital peduncles, mostly exceeding the leaves (often shorter in *C. ambigua*); flowers white, turning reddish or purple.
  Petioles much longer than the leaflets.
    Stems erect, very slender, flexuous; leaflets linear. . . 8. *C. angustissima.*
    Stems trailing or assurgent; peduncles and leaves erect; leaflets oblong or cuneate-oblong. 9. *C. ambigua.*
  Petioles the length of or shorter than the leaflets (leaves sessile or nearly so in *C. chrysophylla*).
    Stems decumbent or assurgent, slender; leaflets mostly acute at each end, reflexed. . . . . 10. *C. hispidula.*
    Stems assurgent, leaflets oblong-obovate. . . . . 11. *C. Smallii.*
    Stems prostrate, spreading.
      Leaflets 1–7 cuneate-obovate, silky-hirsute beneath.
        12. *C. chrysophylla.*

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strigose and somewhat glaucous beneath, the terminal one usually considerably larger than the lateral ones; racemes 1 dm. or less long; flowers few, 6 or 7 mm. long, scattered along the slender ancipital peduncle; bracts minute, setaceous; calyx-teeth setaceous, as long as the tube; corolla rose-purple; vexillum minutely hirsute; legume 3–5 cm. long, 4 mm. wide, straightish, strigose; seeds 5–6, oblong-ovoid, truncate at the ends, brownish.

Nearest to *C. purpurea*, from which it differs in the apparently constant broadly obovate leaflets.

U. S. Colombia, Cartajena, Schott, Leguminosæ No. 16; Ruatan Island, Bay of Honduras, G. F. Gaumer, No. 50, 1886.

Types in Herb. Columbia College (Schott.) and Herb. U. S. Depart. Agric. (Gaumer).

Leaflets 5–13–oblong or oblong-obovate, strigose beneath.

13. *C. Floridana.*

Flowers few, in short-peduncled somewhat spicate racemes, exceeding the leaves.

Stems prostrate or ascending; leaflets, 13–17, oblong or linear-oblong, cinereous-pubescent. . . . . 14. *C. cinerea.*

1. CRACCA VIRGINIANA L.

Cracca Virginiana L. Sp. Pl. 752 (1753).

Galega Virginiana L. Sp. Pl. Ed. **2**: 1062 (1763).

Tephrosia Virginiana Pers. Syn. **2**: 329 (1807).

Perennial from a woody base and long, tough, ligneous root, villous-pubescent or canescent throughout. Stems growing in patches, simple, erect, 3–6 dm. high, angled and striate; leaves elliptical or linear-oblong in outline, 6–10 cm. or more long, subsessile; stipules caducous; leaflets 11–21, 1–3 cm. long, linear-oblong or elliptical, obtuse or acutish, apiculate, glabrous or nearly so above, silky-villous beneath, often becoming glabrate with age; raceme terminal, oblong, sessile; pedicels 5–10 mm. long; calyx silky-villous, the teeth acuminate, cuspidate, mostly longer than the tube; corolla cream-colored, streaked with purple or pink; vexillum pubescent on the outer surface; legume 3–5 cm. long, 4–5 mm. wide, straight or somewhat falcate, villous; seeds 4–8 oblong-ovoid, rounded or truncate at the ends, brownish, mottled with black.

Dry sandy soil, throughout the eastern half of the United States and Canada to North Mexico.

Original locality: Virginia, Canada.

Type in Herb. Linn.

CRACCA VIRGINIANA HOLOSERICEA (Nutt.).

Tephrosia holosericea Nutt. Journ. Acad. Phila. **7**: 105 (1834).

Tephrosia Virginiana var. *holosericea* Torr. & Gray, Fl. N. Am. **1**: 296 (1838).

Stems and racemes densely villous; leaflets sericeous on both sides, often sub-lanceolate and acute; legume densely villous or tomentose.

Arkansas (Nuttall), Illinois (Pitcher), Wisconsin (Lüders), Louisiana (Hale).

Original locality: Plains of Arkansas.

2. CRACCA LEUCANTHA (H. B. K.) Kuntze.

Tephrosia leucantha H. B. K. Nov. Gen. **6**: 460, *t. 577* (1823).

Cracca leucantha Kuntze, Rev. Gen. Pl. 175 (1891).

Perennial from a stout root, cinereous or rusty villous-pubescent throughout. Stems 3–6 dm. or more high, erect, branching, angled and striate; leaves elliptical in outline, 1 dm. or more long; stipules setaceous, caducous; petioles 1–2 cm. long, leaflets 19–25, 2–3 cm. long, oblong, obtuse, often retuse, apiculate, the terminal one often obovate, minutely pubescent above, silky, cinereous-pubescent or villous beneath; raceme oblong, sessile or short peduncled; pedicels 5–8 mm. long; bracts 5–8 mm. long, villous; flowers 1.5 cm. long; calyx villous, tawny or rusty, the teeth acuminate, shorter, or as long as the tube, corolla cream-colored(?), vexillum pubescent on the outer surface; legume 3–4 cm. long, straight or somewhat falcate, spreading, rusty-villous or tomentose; seeds 6–9, oblong-ovoid, pale greenish, smooth.

Very close to *C. Virginiana*, from which it differs in the branching stems, more numerous leaflets, and the tawny pubescence of the inflorescence and legumes.

Arizona, New Mexico, Mexico.

Original locality: Near Guanajuato, South Mexico.

3. Cracca leiocarpa (A. Gray) Kuntze.

Tephrosia leiocarpa A. Gray, Pl. Wright. **2**: 36 (1853).

Cracca leiocarpa Kuntze, Rev. Gen. Pl. 175 (1891).

Perennial from a thick, lignescent root, appressed cinereous-pubescent. Stems 3 dm. or more high, many from the same root, sub-simple, angled and striate; stipules 4–6 mm. long, setaceous, persisting; petioles 1–3 cm. long; leaves linear-oblong in outline; leaflets 17–12 or more, linear-oblong, 2–4.5 cm. long, 5–7 mm. wide, obtuse or acutish, apiculate, glabrous above, sericeous and cinereous beneath; racemes terminal and axillary, short-peduncled, exceeding the leaves; bracts caducous; pedicels 5–8 mm. long; flowers 2 cm. or less long; calyx cinereous, the subulate teeth as long as the tube; corolla purplish; vexillum minutely pubescent; legume 3–5 cm. long, 6 mm. wide, straight, yellowish, glabrous; seeds about 10, sub-orbicular or ovoid, brownish. Mature seeds not seen.

New Mexico, Arizona, Mexico.

Original locality: New Mexico, Wright (No. 965) and North Mexico.

Authentic specimen in Herb. Columbia College.

4. Cracca Lindheimeri (A. Gray) Kuntze.

Tephrosia Lindheimeri A. Gray, Bost. Journ. Nat. Hist. **6**: 172 (1850).

Cracca Lindheimeri Kuntze, Rev. Gen. Pl. 175 (1891).

Perennial from a tuberous and ligneous root, cinereous-pubescent or sericeous throughout. Stems prostrate or ascending, rather stout, flexuous, branching, spreading, 6–12 dm. long, more or less angled; leaves oblong, linear-oblong or obovate-oblong in outline; stipules somewhat persisting; leaflets 9–17, roundish-obovate, nearly sub-orbicular, or obovate-cuneate, 2–3 cm. long, apiculate, pubescent above, densely sericeous or velvety-pubescent beneath; racemes loosely many-flowered; peduncle 1–2 dm. long; flowers 1.5–2 cm. long; pedicels and bracts 5–8 mm. long; calyx sericeous, the acuminate teeth about the length of the tube; corolla red-purple, vexillum pubescent; legume 3–4 cm. long, 5–9 mm. broad, undulate, densely velvety-pubescent, tawny or yellowish; seeds about 4, broad, nearly orbicular, brownish.

Texas, New Mexico, North Mexico.

Original locality, Muskit prairies, on the Liano, Lindheimer (No. 592).

Type in Herb. Columbia College.

5. CRACCA ONOBRYCHOIDES (Nutt.) Kuntze.

Tephrosia onobrychoides Nutt. Journ. Acad. Phila. 7: 104 (1834).

Tephrosia angustifolia and *T. multiflora* Featherman, Bot. Rep. Lousiana Univ. 73 (1871).

Cracca onobrychoides Kuntze, Rev. Gen. Pl. 175 (1891).

Perennial from a somewhat woody base, more or less pilose with spreading rusty hairs throughout. Stems erect, somewhat stout, simple or branching, flexuous, striate and angled above; stipules 8–12 mm. long, often persisting; petioles 1–3 cm. long; leaves oblong or linear-oblong in outline, 1–1.6 dm. long; leaflets 13–25, 2–5 cm. long, cuneate-obovate or oblong, obtuse, often retuse, apiculate, pubescent or glabrate above, more or less closely silky-pilose beneath; raceme terminal or axillary, rusty-villous or rarely glabrate, 3–6 dm. long; bracts 5 mm. long, subulate, mostly caducous; pedicels slightly longer than the bracts; flowers 1–1.5 cm. long, 2-several together on alternate nodes often the whole length of the peduncle; upper calyx-teeth shorter than the tube, the lower one subulate and longer: corolla white turning to pale scarlet; vexillum pubescent on the outer surface, green toward the middle; legume 3–5 cm. long, 5 mm. wide, linear, acute, somewhat falcate, spreading, puberulent; seeds 6–10, round-oblong. Mature fruit not seen.

Arkansas, Indian Terr., Louisiana, Alabama, Texas.

Original locality: In the plains of Arkansas.

6. CRACCA SPICATA (Walt.) Kuntze.

Galega spicata, Walt. Fl. Car. 188 (1788).

Galega villosa Michx. Fl. Bor. Am. **2**: 67 (1803).

Tephrosia villosa Pers. Syn. **2**: 329 (1807).

Tephrosia paucifolia Nutt. Gen. **2**: 119 (1818).

Tephrosia hispida DC. Prodr. **2**: 250 (1825).

Galega paucifolia Curtis, Bost. Journ. Nat. Hist. **1**: 122 (1837).

Tephrosia spicata Torr. & Gray, Fl. N. Am. **1**: 296 (1838).

Tephrosia mollissima Bertol. Bot. Misc. **9**: 10, *t. 3*. (Bot. Zeit. **9**: 902) fide A. Gray, Am. Journ. Sci. (2) **14**: 115 (1852).

Cracca spicata Kuntze, Rev. Gen. Pl. 175 (1891).

Perennial from a long, stout root, more or less rusty-hirsute, or villous throughout. Stems decumbent or ascending, simple or diffusely branching, flexuous, spreading, somewhat angled above, clothed with mostly spreading or reflexed rusty hairs and a shorter, retrose, appressed pubescence, often becoming glabrate with age below; stipules 5–10 mm. long, sometimes persisting; leaves 5 cm.–1.5 dm. long, oblong or linear-oblong in outline, the upper ones subsessile, the lower short petioled (1–3 cm.); leaflets 5–15, 1–2.5 cm. long, 7–12 mm. wide, oval, oblong or cuneate-oblong (the terminal ones often obovate), obtuse, mucronate, often reflexed, minutely pubescent, silky-villous or glabrous above, rusty-villous beneath, often reflexed; racemes terminal and axillary; peduncles ancipital, 1–3 dm. long: bracts 5–10 mm. long, subulate, mostly persisting; flowers 1–1.5 cm. long, remote, few or several together at the summit of the peduncle; calyx-teeth subulate, hispid, slightly longer than the tube; corolla white, turning purple; vexillum pubescent; legumes 3–5 cm. long, 5–6 mm. wide, linear, acute, straightish; seeds 8–12, ovoid, brown.

Differing from *C. onobrychoides* in its more slender and decumbent habit, fewer flowers and less silky pubescence. Growing in low sandy pine lands mostly among grasses, notable for its ascending stems and erect peduncles. Depauperate specimens with the flowers in the axils of the upper leaves have been collected in Florida. Virginia to Florida, westward to Tennessee and Mississippi.

Original locality not given.

Type in Herb. Walter.

CRACCA SPICATA FLEXUOSA (Chapm.)

Tephrosia flexuosa Chapm.; Torr. & Gray, Fl. N. Am. **1**: 297 (1838).

Tephrosia hispidula γ Torr. & Gray, Fl. N. Am. **1**: 297 (1838).

Stems becoming glabrate; leaflets 2–7 pairs, linear, acute, emarginate, reflexed, the terminal one much elongated.

Florida and Alabama.

Original locality: Florida (Chapman).

Type in Herb. Columbia College.

7. CRACCA PURPUREA L.

Cracca purpurea L. Sp. Pl. 752 (1753).

Galega piscatoria Ait. Hort. Kew. **3**: 71 (1789).

Tephrosia leptostachya DC. Prodr. **2**: 251 (1825).

Tephrosia adscendens Macfad. Fl. Jam. 257 (1837).

Tephrosia tenella A. Gray, Pl. Wright, **2**: 36 (1853).

Annual or perennial from a slender woody base, glabrate or strigillose. Stems 1–6 dm. high, erect or ascending, branching, spreading, strigillose on the angles, often glabrate or glabrous and glaucous, striate above; stipules setaceous, often persisting; petioles 1–3 cm. long; leaves 6 cm.–1 dm. long, oblong or linear-oblong in outline; leaflets 7–17, 2–5 cm. long, linear, linear-oblong or oblong-cuneate, obtuse, or acute at each end, apiculate, glabrous above, strigillose or glabrate, lighter and often glaucous beneath; racemes terminal and axillary, 1–2 dm. long; peduncles ancipital; flowers 5–10 mm. long, very short pedicelled; bracts setaceous; calyx-teeth as long as the tube; corolla white, turning purple; vexillum minutely pubescent; legume 3–5 cm. long, 3–4 mm. wide, linear or slightly falcate, strigillose or glabrate; seeds 6–10, oblong brown.

A very variable species with a long and complicated list of synonyms. Known everywhere in tropical and subtropical countries. Two distinct strains have been collected in the United States, the broader-obtuse leaved form occurs in East Florida, and the narrow acute-leaved form (*C. tenella*) in Texas, Arizona, etc.

O. Kuntze (Rev. Gen. Pl. 173) has united *C. purpurea* and several other species to *C. villosa L.* The latter has a villous calyx with long, acuminate teeth and a short reflexed, tomentose legume and is not known from America.

Florida, Texas, New Mexico, Arizona, Mexico. Also in Eastern Central America, Eastern South America to South Brazil, and in the West Indies.

Original locality: Ceylon.

8. CRACCA ANGUSTISSIMA (Shuttlw.) Kuntze.

Tephrosia angustissima Shuttleworth; Chapm. Fl. 96 (1860).

Cracca angustissima Kuntze Rev. Gen. Pl. 174 (1891).

Perennial from a somewhat woody base, very slender, glabrate or minutely pubescent. Stems 3–6 dm. long, prostrate, diffusely branching, flexuous; stipules 3–7 mm. long, setaceous, persisting; petioles 3–9 cm. long; leaves linear-oblong in outline; leaflets 5–17, 1–3 cm. long, 2–3 mm. wide, linear, acute at each end, minutely pubescent beneath; racemes terminal or axillary; peduncles 5–10 cm. long; flowers 8–12 mm. long, solitary or geminate; bracts setaceous, persisting; pedicels 7–10 mm. long; calyx-teeth subulate, about the length of the tube; vexillum pubescent; legume 3 cm. or more, 4 mm. wide, minutely hirsute, somewhat inflated at maturity; seeds 6–8, ovoid, truncate at the ends, black.

Pine barrens, South Florida, near Eau Gallie, Indian River, A. H. Curtiss, N. Am. Pl. No. 584.

Original locality: South Florida, Rugel.

9. CRACCA AMBIGUA (M. A. Curtis) Kuntze.

Galega ambigua Curtis, Bost. Journ. Nat. Hist. **1**: 121 (1837).

Tephrosia hispidula β. Torr. & Gray Fl. N. Am. **1**: 297 (1838).

Tephrosia ambigua Chapm. Fl. 96 (1860).

Cracca ambigua Kuntze, Rev. Gen. Pl. 174 (1891).

Perennial from a woody base, and long, ligneous root, hirsute with short spreading, somewhat viscid hairs. Stems 3–4 dm. or more high, trailing or assurgent, often purplish, dichotomously branching, straggling, angled; stipules 5–7 mm. long, lanceolate, persisting; petioles 3–8 cm. long; leaves 7 cm.–1.5 dm. long, remote, linear-oblong in outline; leaflets 7–11, linear-oblong to cuneate-oblong or obovate, 2–14 cm. long, 5–15 mm. wide, acutish or mostly obtuse, apiculate, coriaceous, glabrous and yellowish-green above, appressed hirsute with whitish hairs and the veins often turning reddish or purplish beneath; peduncles 1–1.5 cm. long, ancipital; flowers few, 10–12 mm. long; bracts 5 mm. long, persisting; calyx-teeth subulate, as long as the tube; vexillum pubescent; legume 4 cm. or more long, 4 mm. wide, straightish; seeds 8–13, ovoid, brown, variegated with black.

High pine lands, dry sandy soil. Trailing, with ascending and almost erect leaves, leaflets and peduncles, or stems ascending with a somewhat bushy habit.

North Carolina and Florida, westward to Mississippi.

Original locality: Sandy woods near Wilmington, North Carolina.

Type in Herb. Columbia College.

10. CRACCA HISPIDULA (Michx.) Kuntze.

Galega hispidula Michx. Fl. Bor. Am. **2**: 68 (1803).

Tephrosia hispidula Pers. Syn. **2**: 329 (1807).

Tephrosia gracilis Nutt. Gen. **2**: 119 (1818).

Tephrosia elegans Nutt. Journ. Acad. Phila. **7**: 105 (1834).

Cracca hispidula Kuntze, Rev. Gen. Pl. 174 (1891).

Perennial from a slender, woody base, minutely appressed-hispid or glabrate. Stems 1–3 dm. or more long, decumbent or assurgent, dichotomously branching, straggling, angled; stipules 2–5 mm. long, subulate, sometimes persisting; leaves 3–6 cm. long, linear-oblong in outline, short-petioled, (5–10 mm.) the upper ones often sessile; leaflets 7–13, elliptical, oval-oblong, or linear-oblong, 8 mm.–2 cm. long, 4–8 mm. wide, acutish, sometimes obtuse, apiculate, reflexed, glabrous above, appressed hirsute with whitish hairs and the veins often turning purplish beneath; peduncles terminal and axillary, ancipital, 5–10 cm. long; flowers solitary or geminate, scattered at the summit of the peduncle, 10–12 mm. long; bracts 2–5 mm. long, setaceous; calyx-teeth acute as long as the tube; vexillum minutely pubescent; legume about 4 cm. long, 4–6 mm. wide, straightish or slightly falcate, minutely hispid; seeds 8–12, ovoid or nearly orbicular, brownish.

Low pine lands, sandy soil, stems ascending, rarely prostrate or trailing, leaves and peduncles erect, leaflets reflexed, smaller and more acute than the other species in this section.

Virginia and North Carolina to Florida, westward to Louisiana.

Original localities: Virginia, Carolina and Georgia.

Type in Herb. Michaux.

11. CRACCA SMALLII.

Cracca intermedia Small, Bull. Torr. Club, **21**: 303 (1894), not *Tephrosia intermedia* Graham; Hook. Fl. Brit. Ind. **2**: 112 (1879).

Perennial from a woody base, pubescent throughout and somewhat viscid. Stems 4–6 dm. long, branched from the base, spreading, assurgent, flexuous, more or less angled; stipules subulate, caducous; leaves oblong-obovate in outline, 6–12 cm. long; petioles 1-cm. long; leaflets 3–11, oblong-obovate, 1–3 cm. long, 6–14 mm. wide, glabrous and yellowish-green above, strigose with whitish hairs and becoming somewhat purplish beneath, truncate at the apex, apiculate; peduncles 8 cm., 1–5 dm. long; bracts subulate, 5–7 mm. long; flowers 1 cm. long, mostly solitary or geminate, remote; calyx-teeth lanceolate, acuminate; vexillum minutely pubescent; legume 3.5–4 cm. long, about 4 mm. wide, straightish, strigillose; seeds 5–9, oblong or oblong-ovoid, compressed, smooth, variegated with black.

Dry and poor "blackjack thickets." Differing from *C. chrysophylla* in its assurgent habit, the greater number and shape of the leaflets, the smaller flowers and larger seeds, as well as the character of the pubescence on the under surface of the leaflets.

Florida, Chapman, Curtiss; Georgia, Boykin.

Original locality: near Jacksonville, Florida (Curtiss).

Type in Herb. Columbia College.

12. CRACCA CHRYSOPHYLLA (Pursh) Kuntze.

Tephrosia chrysophylla Pursh, Fl. Am. Sept. 489 (1814).

Galega prostrata Nutt. Gen. **2**: 120 (1818).

Cracca chrysophylla Kuntze, Rev. Gen. Pl. 174 (1891).

Perennial from a long ligneous root. Stems prostrate, 3 dm.–1 m. long, dichotomously branching, clothed with a close, short, somewhat viscid and spreading silvery or tawny pubescence; stipules subulate, caducous; leaves 3–5 cm. long, oval in outline, sessile or very short petioled; leaflets 3–9, (rarely 1-foliolate,) 1–3 cm. long, 7 mm.–2 cm. wide, cuneate-obovate, obtuse, often retuse, sometimes apiculate, coriaceous, glabrous and yellowish-green above, silky hirsute and somewhat lighter or rusty beneath, the terminal one often conspicuously larger than the lateral ones; peduncles 4–6 cm. long, axillary, ancipital; flowers 1–1.5 cm. long, few; bracts 5 mm. long, subulate, persisting; calyx-teeth acuminate, as long as the tube; vexillum minutely pubescent; legume 3–4 cm. long, 5–7 mm. wide, minutely hispid, straightish, erect or spreading; seeds 8–10, oblong, ovoid, or sub-orbicular; brownish or greenish, variegated with black.

Pine lands. Truly prostrate, with prostrate leaves, widely spreading, forming broad mats.

Georgia to Florida and westward.

Original locality: In Georgia.

CRACCA CHRYSOPHYLLA CHAPMANNI n. var.

A low prostrate slender plant with stems 2 dm. or more long; leaves 1–2 cm. long; leaflets 5–10 mm. long, oblong or obovate, apiculate, glabrous above, appressed silky-hirsute beneath; legume 2 cm. long, 3 mm. wide, minutely hirsute, 4–7 seeded.

St. Joseph's, Florida, Chapman.

Type in Herb. Columbia College.

13. CRACCA FLORIDANA n. sp.

Perennial from a short, somewhat creeping ligneous root. Stems prostrate, 2–6 dm. or more long, dichotomously branching, spreading, angled above, clothed with a short appressed or spreading often somewhat viscid pubescence; stipules 3–5 mm. long, subulate, often persisting; petioles 1–2.5 cm. long; leaves 4–10 cm. long, oblong or rarely linear-oblong in outline; leaflets 9–13, oblong or oblong-obovate obtuse or truncate at the apex apiculate, 1.5–3 cm. long, 5–12 mm. wide, glabrous and yellowish-green above, lighter, strigose with whitish hairs and the veins turning reddish beneath; peduncles terminal and axillary, 7 cm.–2 dm. long; bracts subulate; pedicels 5–8 mm. long; flowers solitary or geminate, 1–1.5 cm. long; legume 3–4 cm. long, 4 mm. wide, erect, straight, strigillose; seeds 6–10, oblong, ovoid, grayish or brownish variegated with black.

Differing from *C. chrysophylla* in its more numerous, narrower leaflets and the pubescence of the lower surface, which is that of *C. Smallii.* It is very close to the latter, from which it differs however, in its truly prostrate and spreading habit, narrower and more numerous leaflets.

Central Florida, G. V. Nash, Nos. 494½, 1198, 1263, 1334, 1552, 1615. Louisiana, New Orleans, Dr. Ingalls.

Types in Herb. Columbia College.

14. CRACCA CINEREA (L.) Morong.

Galega cinerea L. Amœn. Acad. 5: 403 (1759).

Tephrosia cinerea Pers. Syn. 2: 528 (1807).

Cracca cinerea Morong, Ann. N. Y. Acad. Sci. 7: 79 (1892).

Perennial from a stout, ligneous root and woody base. Stems prostrate, diffuse, or ascending, 3–6 dm. or more long, appressed cinerous-pubescent, or with somewhat spreading rusty hairs above, becoming glabrate with age, angled and channelled above; stipules 3–8 mm. long, subulate, acuminate, persisting; petioles 5 mm. to 1.5 cm. long; leaves oblong in outline, 4–10 cm. long; leaflets 16–17 oblong, linear-oblong, 2–5 cm. long, 4–8 mm. broad, the basal and terminal ones often obovate-oblong, obtuse or acutish at the apex, acute at the base, glabrous above, cinereous-strigose or pubescent beneath, becoming often glabrate with age; racemes 7–8 cm. long; flowers 1 cm. long, geminate or in clusters, scattered; bracts subulate or setaceous, persisting; calyx-teeth acuminate, as long as the tube; corolla purplish, vexillum pubescent; legume 3–4 cm. long, 4 mm. wide, spreading, cinereous-pubescent or glabrate, straight; seeds 6–9, ovoid, somewhat truncate at the ends, brown.

Ballast ground, Mobile, Alabama (Ch. Mohr); Mexico and the West Indies, etc.

Original locality: Jamaica.

I am much indebted to Dr. N. L. Britton for his help and counsel in this study and for the use of the Herbarium of Columbia College. Mr. G. V. Nash has given me valuable assistance with copious field notes of the Florida species.

Mr. Coville also very kindly loaned me the collection of the United States Department of Agriculture for examination.

Contributions to American Bryology.—IX.

By Elizabeth G. Britton.

A REVISION OF THE GENUS SCOULERIA WITH DESCRIPTION OF ONE NEW SPECIES.

(Plate 227.)

The genus *Scouleria* was founded by Wm. Hooker in 1830, on specimens collected by Dr. Scouler at Observatory Inlet, described as *S. aquatica*, and subsequently distributed in Drummond's Musci Americani as No. 63, collected in the Columbia and Portage Rivers. A few autograph duplicates of Dr. Scouler's specimens were also distributed in this country, and Dr. Torrey was fortunate in possessing one of them, as well as a set of Drummond's Mosses.

In 1851 C. Mueller transferred *Scouleria aquatica* to *Grimmia* as *G. Scouleri*, and Lesquereux and James in the Manual 1884 followed his example. Mitten in 1869 also subordinated the genus to *Grimmia*, describing one new species *Grimmia patagonica* (Journ. Linn. Soc. **12**: 96, 1869), which Jaeger (Adumb. 1875) changed to *Scouleria patagonica*. Since then the genus has been maintained as valid. In 1889 Kindberg described in the BULLETIN *S. aquatica* var. *nigrescens*, which Mueller in 1890 raised to specific rank as *S. Nevii.* In Macoun's Catalogue, 1892, another species was described by Kindberg *S. Muelleri*, and in a recent number of Hedwigia Mueller described *S. aquatica* var *catilliformis* from Röll's collections. This makes four species and one variety thus far described in the genus.

Having had occasion to examine critically some specimens received from the Department of Agriculture, collected in the State of Washington by Leiberg and Sandberg, I found it necessary to see authentic specimens and original descriptions of all the species. These we have been fortunate in possessing either in the Torrey or Jaeger herbaria, where we found Lobb's specimens of *S. patagonica*, and the others have been sent us by Prof. Macoun, and by Dr. Watson in former years.

As a result we have reached different conclusions from those of Müller and Kindberg, and are of the opinion that *S. aquatica* is a very variable species, within certain narrow limits. That the forms which have been separated from it as *S. Nevii*, and *S. Muelleri*, intergrade with it is beyond question, and I have been able to prove that the characters which have been relied on to found specific differences may all be found on one specimen, of either or any of the species distributed under the new names. There are some characters which seem to have been given too much weight, and others too little. I find that the tendency to differentiation of the cells bordering the leaves runs through all the species, and reaches its maximum in the Patagonian specimens, by the formation of a thick border just inside the margin, composed of parenchyma cells on the upper surface of the leaf, with yellow prosenchymatous cells on the lower surface like those composing the vein, giving the leaf the aspect of being triple-veined. In Watson's specimens from Spokane Falls, which I have described as a new species, *S. marginata* (presumably those referred to in the Manual under *G. Scouleri*) I also find this character developed though in a less marked degree. The margins are bistromatic, or else the cells are larger and darker in color, though never as dense and dark, as in *S. patagonica*. Specimens of *S. aquatica* var. *nigrescens*, also show an upward continuation of the basal submarginal prosenchymatous cells, and this is more or less evident in all the specimens, even Scouler's of *S. aquatica*, though much less prominent in the young green leaves from the apex of the stems than in the older leaves, where they become differentiated in color, showing as yellow streaks, irregularly between the vein and margin, but always near the margin.

Another peculiar character, which has been mentioned in *S. patagonica*, but not in any other species, is the development of filamentous radicles on the vein at base. Mitten described them "Nervo obscuro inferne dorso radicellis vestito." This character is very prominent in some of our specimens, and in fact is hardly absent from any of them, the whole lower surface of the vein in some leaves being densely covered with scattered or tufted, seemingly glandular hairs. The serrations of the margins too, are very variable, and of no value for distinguishing the species. The young green leaves are always more sharply and irregularly serrate, generally also at the apex, but the older leaves on the same stems, are often entire at apex, and indistinctly serrate below; I have even seen leaves quite entire, on the same plants. The teeth are often black and swollen, though this is never a constant character.

The cucullate apex, for which Mueller has named the var. *catilliformis*, is due to the bending of the vein a short distance below its apex. This too seems to be a character of the younger leaves. They also vary in being serrate on the back near the apex, and the vein is sometimes much thickened, and prolonged to the summit of the leaf, as figured by Schwaegrichen, instead of ending below the apex as it usually does. The color and size of the 3–4 rows of marginal cells of the leaves also varies, and in some leaves the green quadrate cells of the margins are so sharply differentiated from the elongated narrower submarginal ones, that they form an undulate border next to a deep yellow fold on each side.

SCOULERIA AQUATICA Hook. Bot. Misc. **1**: 33, *t. 18* (1830).

A portion of the type specimens collected by Scouler are in our possession, and the following description was drawn from them, giving measurements which Hooker did not give.

Plants 5–6 cm. long, stems flexuose, sparingly branched; lower leaves abraded, upper oblong lanceolate, 4 mm. long by 1.5 mm.

wide, apex cucullate, rounded, entire or serrate, vein ending below it, not filamentous at base; margins serrate only above the middle, not bordered, the cells only slightly larger and darker, upper cells irregular, .010–.013 mm.; basal rectangular, rarely a few prosenchymatous cells were seen just inside the basal margin, mostly pale and rectanglar. Spores .048–.050 mm., smooth, brown.

On consulting the original description and plate, we find that *Scouleria aquatica* was originally described as black, and the type specimens are quite as dark as Macoun's specimens of var. *nigrescens*, thus invalidating the first and most conspicuous character of that variety. The leaves are described as dark green, the upper ones only as green. The border of the margin is indicated by submarginal lines in figures 2–3 of the original plate.

The specimens distributed in our set and Prof. Macoun's of Drummond's Mosses No. 63 differ from Scouler's and from each other slightly. Prof. Macoun has three plants, two are 12–13 cm. long, large, coarse, simple stems, and sterile, with the leaves long and broad, coarsely serrate and bordered with yellow, the vein strongly filamentous, the submarginal basal cells yellow and prosenchymatous, and the lower margins undulate. The third plant in his set is a small branching, fertile one, with black abraded leaves, shorter and denser, often entire, with the margins yellow and thickened. Our specimens of Drummond's No. 63 are like these, the leaves being only 2–2.5 mm. long, and differing from Scouler's in their blunt, flat, entire apex with the basal cells more distinctly prosenchymatous and yellow. They were cited in the original description of *S. aquatica*.

It seems evident from the above that, as originally founded, this species was recognized as variable, for we have indicated three discrepancies in the original specimens and descriptions. The larger forms may be referred to the variety *nigrescens* Kindb., which may be distinguished by the taller plants, darker and coarser than the type, with long simple stems, large black leaves, often blunt and entire at apex, the basal cells yellow or brown, prosenchymatous, with the vein often thickened and serrate at apex and filamentous at base.

SCOULERIA NEVII Müller, Bull. Torr. Bot. Club, 17: 273 (1890).

The description given in Macoun's catalogue for *S. Nevii* is more than half devoted to *S. aquatica*, and from it we gather that the main difference is the width and shape of the leaves, and the broad, rounded entire apex. We have seen all of Prof. Macoun's specimens, and tried the following experiment; taking several stems from different plants, we divided them into 5–6 sections each, and compared the leaves. In all cases we found that the upper green leaves at the tips of the branches were longer and narrower, more acuminate and more sharply serrate, with the apex also serrate and generally cucullate; the lower cells also were seldom differentiated, generally paler and oblong, not prosenchymatous. The lower leaves on the same plants were shorter and broader, often entire and rounded at apex, the cells denser and darker, and often yellow with traces of prosenchymatous cells.

We have not been able to find that any of the characters are constantly associated together, so that we cannot maintain *S. Nevii* as a species, even if the name had priority over the var. *nigrescens*; but there seems to be sufficient reason in maintaining the latter as a variety, as we have shown from the descriptions of Drummond's specimens and Macoun's collections.

We found one of Macoun's specimens of "*S. Nevii*" agreed with the specimens from Yale labelled var. *virescens* (Bull. Torr. Bot. Club **16**: 93, 1889), having the upper leaves of that brilliant emerald green color which is so striking in these specimens. On the younger and smaller plants the leaves are green. Large, coarse, old plants, with ragged leaves, are almost black.

SCOULERIA MUELLERI Kindb.; Macoun's Catalogue, 6: 62 (1892). Macoun's Canadian mosses, No. 558.

The description calls for different specimens from those of No. 558, which we have received from Prof. Macoun. Those sent us are undoubtedly referable to *S. aquatica*, with which they agree in every way. The description reads the median basal cells "linear, porose and numerous," the apex entire rounded, and the margin "pale orange." In our specimens the basal cells are rectangular, with a few very faint traces on some of the leaves of the yellow prosenchymatous cells referred to in the description. The apex is as often serrate as entire, and the marginal cells are green, in 6–7 rows, and though larger and more distinct than the inner ones, are not "pale orange."

We have taken particular pains to see as many specimens of Macoun's No. 588 of *S. Muelleri*, as possible, thinking that perhaps there might be a mixture of specimens, and perhaps our *S. marginata* be found among the number. But Prof. Macoun assures us that the species is local, and all the specimens of this number were collected from the same place and grew on the same rock. This is very interesting, for the specimen in our set agrees with Scouler's specimens of *S. aquatica*, the ones from Prof. Eaton's set are referable to var. *nigrescens*, and these last of Macoun's, he assures me, are the very ones from which Kindberg named *S. Muelleri.*

Key.

Leaves bordered by slightly larger, thick-walled cells, in a single layer, green, yellow or black, peristome present, ...1. *aquatica.*

Leaves bordered by larger, denser cells in a double layer, often prosenchymatous almost to apex, peristome absent, ...2. *marginata.*

1. SCOULERIA AQUATICA Hook.

Scouleria aquatica Hook. Bot. Misc. **1**: 33, *t. 18* (1830).

Grimmia Scouleri Müll. Syn. Musc. Frond. **2**: 654 (1851).

Scouleria aquatica var. *virescens* Kindb. Bull. Torr. Club, **16**: 93 (1889).

Scouleria Muelleri Kindb. Macoun's Cat. part 6: 62 (1892).

Scouleria aquatica var. *catilliformis* Müll. Hedwigia, **32**: 207 (1893).

Plants dark green or black, gregarious, growing in tufts; stems rigid, simple or branching, 5–15 cm. long; leaves when old abraded, only the veins remaining, upper green, walls less thickened, more prominently serrate than the lower, which are often black, entire, bordered with yellow or black thick-walled cells; vein thick, ending below the apex, often arched and serrate on back above and filamentous below; apex rounded and flat or cucullate, serrate or entire; basal cells variable on the same plants, on the upper leaves pale often entirely rectangular, on the lower often yellow or brown, with streaks of prosenchymatous cells, just inside the margin, extending upward irregularly, the marginal rectangular, often undulate. Capsules almost immersed, on a short seta, oblate-spheroidal, becoming more depressed after the dehiscence of the lid, which remains attached to the columella, and exserted, long after maturity; calyptra cucullate, peristome single, red, teeth 16, irregularly divided and broken, often falling with the lid; spores large, smooth, .037–.059 mm. maturing in May and June to August and September.

A variable species, growing on rocks in mountain streams, more or less local, but abundant.

Original locality: Observatory Inlet, Scouler, 1829. Distributed from the Columbia and Portage Rivers in Drummond's North American Mosses, No. 63. Also collected by Lyall in the Columbia River, by E. Hall in Oregon, Bolander in California, Leiberg in Traille River and Lake Pend d'Oreille, Idaho, and by Macoun in several localities in British Columbia and Vancouver Island.

1a. SCOULERIA AQUATICA NIGRESCENS Kindb. Bull. Torr. Club, **16**: 94 (1889).

Scouleria Nevii Müller, Bull. Torr. Bot. Club, **17**: 273 (1890).

Plants coarse and rigid, in large dense black tufts; stems 10–15 cm. long, brittle, and clothed with the persistent veins of the leaves, branching above; leaves 2–3 mm., oblong lanceolate, blunt and entire at the rounded apex, vein ending below it, often radiculose at base; margins serrate, basal cells rectangular next the vein, prosenchymatous near the margin, but extending upward only a short distance; some leaves simply hyaline at base with all cells rectangular.

Original locality "On rocks in Nanaimo River, Vancouver Island. Also collected at Sicamous, B. C., in 1889, and Rogers Pass, Selkirk mountains, B. C., in 1890 and 1885. Distributed as No. 388 of Macoun's Canadian mosses.

These four specimens, presumably named by Kindberg, illustrate the variation of the species, two being large, coarse plants, with larger leaves and the basal cells prosenchymatous, the other two small branching plants, with short leaves, and the basal cells scarcely prosenchymatous.

2. SCOULERIA MARGINATA n. sp. Plate 227.

Plants 3–4 cm. high, gregarious in dense black tufts; stems wiry and naked at base, branching and densely leafy above; leaves crowded, curled and twisted when dry, only the uppermost green, 2–3 mm. long, oblong lingulate, serrate above the middle, or obscurely serrulate near the base, teeth occasionally black and thickened; apex blunt, entire or toothed, vein thick, ending below it, smooth on back; basal cells green rectangular, a narrow band, near the margin elongated, prosenchymatous, forming a dark dense border nearly to the apex of the leaf, superposed by rounded small cells; perichaetial leaves surrounding the capsules, ovate-lanceolate; capsules, small, broader than long, cupuliform when old; lid persistent on the columella, bordered with red; peristome none, mouth bordered; spores .048–.054 mm., green with a minutely roughened coat, maturing in August and September.

"Spokane Falls, Washington Territory, collected by Sereno Watson, September 24, 1870." Presumably the same specimens are referred to in the manual under *G. Scouleri*, Müller, as being abundant. Distributed with the plants collected on Clarence King's Expedition on the Exploration of the 40th Parallel.

Since collected by Marshall A. Howe on rocks just above the water in the Sacramento River, Sims, Shasta county, Cal., August 10, 1894.

Closely allied to *S. Patagonica*, but the marginal cells are less dense, often only one layer of cells, but larger and square in section.

Description of Plate 227.

Fig. 1. Plants natural size. 2. Capsule enlarged, lid on. 3. Capsule after dehiscence of lid. 4–5. Outlines of leaves. 6. Basal cells of leaf. 7. Apex of leaf. 8. Cells from the middle of the leaf, showing the elongated, submarginal cells. 9. Cross-sections of leaf, showing the thickened margins. 10. Cells from the upper surface of the leaf. 11. Spores.

Studies in the Botany of the Southeastern United States.—III.

By John K. Small.

(Plate 228.)

Tsuga Caroliniana Engelm. Coult. Bot. Gaz. 6: 223 (1881).

This tree can now be added to the flora of Georgia. Formerly it was known only from the Carolinas and Virginia. There it grew at altitudes ranging from 2,100–5,000 feet. I found it in 1893 growing on the southern ledges of the cañon at Tallulah Falls, thus extending its range many miles to the south and its altitude to 1,600 feet. It was most plentiful about 300–400 feet above the river and reached no great development on account of the scarcity of soil and the perpendicular position of its place of growth. As was the case in all the other localities where I saw this species, *Tsuga Canadensis* was present and rather the more plentiful of the two, thus serving to show the great contrast between these two hemlocks.

Cyperus squarrosus L.

This most beautiful little species of *Cyperus* has been found for the first time on the North American continent at Jacksonville, Florida, by Mr. A. H. Curtiss. The Florida specimens agree exactly with Wright's Cuba collection, No. 3355 (distributed as *C. aristatus*), also with plants from the Antilles, Surinam (Schweinitz), and Bailies' Niger Expedition of 1857–9 as well as with East Indian specimens.

Juncus Georgianus Coville.*

Rumex spiralis n. sp.

Perennial, slender, glabrous, light-green, somewhat glaucescent. Rootstock woody, creeping, 1–2 dm. long; roots fibrous; stem erect, 8–9 dm. long, simple or sparingly branched above, leafy throughout, slightly flexuous, strongly channeled, woody below; leaves lanceolate or oblong-lanceolate, 6–13 cm. long, 1.5–4.5 cm broad, acute or sometimes attenuate at the apex, the lower ones obtuse or truncate at the base, the upper acute or acuminate at the base, all rather long petioled, coriaceous, light green, undulate and crisped, neither prominently nor conspicuously nerved; petioles strict, 2–5 cm. long; orceae cylindric nearly one half as long as the internodes; inflorescence terminal, simply paniculate, naked; racemes (fruiting) 5–12 cm. long, dense, rather erect, the terminal one usually about twice as long as the lateral ones; calyx 2 mm. broad; pedicels varying from 2–4 mm. in length, jointed below the middle; wings broadly ovate cordate, broader than high, 1 cm. long, 1–1.2 cm. broad, straw-colored, sometimes slightly constricted below the apex, conspicuously and prominently nerved, crenulate and undulate, each one bearing an oblong-ovoid callosity, the three wings strongly spirally twisted; achene broadly oblong-ovoid, 3 mm. long, short-pointed, chestnut colored, its faces nearly flat, its angles conspicuously margined. Plate 228.

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* Juncus Georgianus Coville n. sp.

Perennial, densely tufted, 20 to 35 cm. high; stems erect, barely exceeding 1 mm. in diameter, striate when dry; leaves all radical; sheaths striate, stramineous, loose, minutely auriculate, commonly 2 to 4 cm. long, the innermost closely embracing the stem and sometimes reaching a length of 8 cm.; blades erect, some of them reaching at least the base of the inflorescence, transversely flattened, nodeless, striate on the back, 1 mm. or less in width, sometimes involute when dry, sharply acute at apex; inflorescence paniculate, about 5 to 10 cm. high, strict or only slightly spreading; lowest involucral leaf foliose, not exceeding the panicle; flowers rarely more than 25, usually not more than 10, inserted singly on the branches of the panicle, prophyllate; perianth 4 to 6 mm. long, its parts subulate-lanceolate, when young with a green midrib, usually reddish brown lateral stripes, and hyaline margins, when old stramineous; stamens 6, one-half to two-thirds the length of the perianth, the anthers 1.5 to 2 mm. in length and several times longer than the filaments; style and stigma long, the former often reaching 2, the latter 3, mm. in length; capsule about three-fourths as long as the perianth, narrowly oblong-lanceolate in outline, obtuse or broadly acute, mucronate, 3-celled; seed about 0.4 to 0.5 mm. in length, oblong, reticulate, the areolæ linear and arranged transversely on the seed in about sixteen longitudinal rows.

Type specimen in the U. S. National Herbarium, collected in May, 1869, on Stone Mountain, Georgia, by William M. Canby.

This plant is most nearly related to *Juncus tenuis*, but is easily distinguishable from that species by its long radical leaves, its longer and brown-striped perianth, narrower capsules, and especially by its very long anthers. Contrasted with *Juncus tenuis*, the long radical leaves, short stems, and large inflorescence of *J. Georgianus* give the plant a characteristic general appearance. Mr. Canby's specimens were distributed doubtfully identified as *J. tenuis*, and no botanist seems to have collected the plant since, until Mr. Small rediscovered it July 4, 1893, on the summit of Stone Mountain, at the altitude of 1686 feet. He collected it also on Little Stone Mountain, July 7, 1893, between 1,000 and 1,100 feet altitude.

Frederic Vernon Coville.

Found growing in the mud on the margins of ponds near Kenedy, Carnes county, Texas, by Mr. A. A. Heller, collected in flower and fruit on May 26, 1894. The altitude of the station is about 400 feet. no. 1781

Its nearest relative is *Rumex altissimus*, from which, however, it differs in having more characteristically lanceolate leaves, which are longer-petioled, crisped and the larger ones more or less truncate at the base instead of acuminate. The panicle of *R. spiralis* is more open, not leafy, and its racemes are denser and thicker. Wings twice to thrice as large as in *R. altissimus* invest the broadly oblong-ovoid achene. The former are broader than high and strikingly cordate, whereas those of *R. altissimus* are higher than broad, not strongly cordate and less prominently nerved. So far as observed three callosities are developed throughout.

BAPTISIA SERENAE M. A. Curtis, Amer. Journ. Sci. (I.) 7: 406 (1845).

The range of this species, heretofore confined to the uplands and foot-hills in South Carolina and Georgia, has now been extended into the low country by its discovery by Miss Katherine A. Taylor in the pine barrens about Summerville, South Carolina.

OXALIS RECURVA Ell. Bot. S. C. & Ga. 1: 526 (1821).

Since writing my paper on the above species, which was published in the November BULLETIN, the plant has been found by Prof. A. Ruth and Mr. T. H. Kearney, Jr., at Wolf Creek, Eastern Tennessee, and by myself at the Falls of the Yadkin River, in Stanley county, middle North Carolina, where it grows in the sand in shady places at the bottom of the cañon. The latter locality is within the range as formerly known, but the former is a little west of the range shown in the above cited paper.

HYPERICUM BUCKLEYI M. A. Curtis. Amer. Journ. Sci. **44**: 80 (1843).

When on the summit of the Thomas Bald, on the Georgia and North Carolina boundary, in 1893, I encountered a peculiar *Hypericum*. This summit is nearly 5,300 feet above the sea level and is remarkable for its shape, which is almost knife-like, being but a few yards broad and three miles long by actual measurement. The top, which is composed of soil and outcropping gneiss, is free from timber, except a few scattered red oaks. On the gneiss outcrops this *Hypericum* forms dense cushions and mats, rising above the ground only two inches. Altitude has had a striking effect on the species there and at first sight one is not inclined to refer it to the above. The locality is in view of the original and later stations for *H. Buckleyi* and a comparison with all the material at hand shows these differences. Its leaves are at least one-half smaller than the usual and rather constant form. The seeds are one-third smaller and more curved, while the flower and all its parts, together with the capsule, are also one-third smaller than those from the neighboring territory.

✓ MONNIERA CRENULATA n. sp.

Perennial, bright green, very aromatic. Stem procumbent or decumbent, creeping, ascending at the ends, 3–6 dm. long, branched from the creeping nodes, more or less channeled, pilose with rather rigid, irregularly jointed hairs; leaves broadly or orbicular-ovate, 1.5–2.5 cm. long, 1.5–2.2 cm. broad, subcordate and amplexicaul, obtuse or slightly emarginate at the apex, remotely but distinctly crenulate, mostly eight-nerved, obscurely pilose-ciliate near the base and on the midrib beneath, glandular-punctate, exceeding the internodes, except on the lower part of the stem; pedicels 1–1.5 cm. long, pilose; bractlets 1 cm. long, very similar to the leaves in shape, texture, etc., but eciliate except a tuft of hair at the apex; calyx segments lanceolate, ciliate, nearly equalling the bractlets; corolla campanulate, 1–1.3 cm.

long, slightly unsymmetrical, cleft for about one-third of its length; style about equalling the distal pair of stamens; capsule ovoid-oblong.

Found by Mr. A. H. Curtiss, growing in the bottom of ditches between Jacksonville and Trout Creek, Florida, on July 13th 1893.

The above described species is related to *Monniera amplexicaulis* of Florida, but is easily separated from it by its much larger size, its broader leaves, the elongated pedicel and the larger flowers. In some respects it is closely related to *M. lanigera* of the tropics, but in the latter species the nerving of the leaves is pinnate and the intenodes longer than the leaves, while in *M. crenulata* the leaves are flabellinerved and longer than the intenodes.

LYCOPERSICUM ESCULENTUM Mill.

Is spontaneous about the village of Stone Mountain, Georgia, and also at points along the Georgia Railroad.

COREOPSIS LONGIFOLIA n. sp.

Annual or perennial (?) from an enlarged and somewhat woody base, slender, glabrous, bright green. Stem erect, 7–10 dm. long, simple or sparingly branched at the summit, not angled but channeled by twelve or thirteen grooves, leafy on the lower half, naked above, slightly flexuous; leaves linear-oblong, linear-lanceolate or linear, 7–10 cm. long, .2–1 cm. broad, acutish, acuminate at the base, long-petioled, reduced above to narrow and inconspicuous bracts; petioles 6–8 cm. long, very narrowly winged, enlarged at the base, in most cases forming a short sheath which clasps the stem; heads 1–6, about one hundred flowered, 3–4 cm. broad; rays yellow, eight, 1.5–2 cm. long, spatulate or oblanceolate, three-cleft, the segments acutish or the middle one obtuse; the outer involucral scales lanceolate, marked with a dark rib, the inner scales twice as long as the outer, oblong-elliptic, thin, acutish, tipped with brown; floral scales, linear, 6 cm. long, acutish; flowers, 4 cm. long, style slightly exserted, two-cleft; achene obovoid or spatulate in outline, black, the awns mostly fugacious, the wings pectinate, the segments equal or nearly so.

Related to *C. angustifolia*, from which species it differs in its more slender build, the striking length of the leaves and the larger flowers. The achene is also larger and of a darker color. In *C. angustifolia* to the wings of the achene are cut in an irregular manner and the awns persistent, while the wings in *C. longifolia* are regularly and evenly divided and the arms mostly fugacious.

The type was found in dry, grassy pine woods about Jacksonville, Florida, by Mr. A. H. Curtiss on October 16, 1893.

Coreopsis major linearis n. var.

Perennial by a slender creeping root-stock, slender, sparingly and inconspicuously pubescent. Stem erect, 3–5 dm. long, simple, conspicuously channeled; leaves three-parted, the segments linear, 3–11 cm. long, 1–3 mm. broad, acuminate at both ends; heads solitary, 3–4 cm. broad; outer involucral bracts 4 mm. long, oblong, obtuse; rays oblong obtuse, somewhat two-cleft; achene smaller than in the typical form.

Although reluctant to describe varieties the above is so distinct from *Coreopsis major* that it would be hardly fair to pass it. It is much more distinct than the variety *Oelmeri*. The strongest characters are the very slender build and the strikingly narrow leaf-segments which average about 2 mm. in breadth. Their length is also greater than we find the ordinary forms of the type.

I noticed the plant at different localities in middle Georgia, and collected it on Little Stone Mountain, at the base of Stone Mountain, and also in the Yellow River Valley, in Gwinnette county.

Coreopsis major Walt. Fl. Cor. 214 (1788).

A peculiar state of this species has been coming to my notice for a year or two. It is the above with its leaves undivided, there being two opposite and entire leaves at each node in place of the normal three-parted ones. It seems to have been first collected by Dr. and Mrs. Britton, at Black Mountain Station, North Carolina. Later Mr. Heller secured it near Salisbury, N. C., and last season (1893) I came upon it at the western base of Stone Mountain, Georgia. Besides having this state we have an intermediate one in which the upper leaves are entire and the lower ones three-parted in the usual manner. This latter was secured by Dr. and Mrs. Britton at Balcony Falls, Virginia (1885).

New Plants from Idaho.

By Louis F. Henderson.

Phacelia Idahoensis, n. sp.

A foot and a half to two feet high, from nearly glabrous at bottom to slightly villous-hirsute in the inflorescence, leafy to the top; radical and lower cauline leaves about 5 inches long, on petioles from an inch and a half to two inches in length, pinnately parted or divided into broad or comparitively narrow inch-long, cleft divisions, dark above, light beneath, and delicately strigose; middle cauline leaves short-petioled, upper sessile, all pinnately cleft or parted; short spikes crowded during anthesis in a naked spike-like thyrsus about 3 inches long by ¾ inch thick, in fruit becoming more elongated and open; flower buds violet blue, becomwhite-blue on opening; flowers open-campanulate, cleft barely to the middle, and bearing the vertical appendages of *P. sericea*; anthers oval; styles 2-cleft at apex, these with the stamens hardly longer than the corolla; capsule ovate, short-acuminate, contained within the marcescent-persistent corolla, 12–22-seeded; seeds oblong-oval, generally irregularly and strongly angled by pressure, acute at one end, less so at the other, longitudinally and rather deeply alveolate, the walls separating the alveolations thin and sharp.

Common in moist, natural meadows of Craig Mountains, Nez Perces county, at about 3000 ft. alt. A single specimen in fruit was found on the St. Marie's River, Kootenai county, proving that the plant must be well distributed in Northern Idaho. That the species is closely related to *P. sericea* A. Gray, is evident on close inspection. In aspect, however, it is very different, and the relationship would hardly be suspected. It differs from this species in being nearly glabrous, erect, and 2–3 times as high; in its stamens and style being never more than half again as long as the corolla; in its thyrsus being much more slender and rather longer; finally in the deeper alveolations of its strongly angled seeds. It differs from the var. *Lyallii* in its taller stature, in its narrower and longer thyrsus, and, if the flower and seed characters are those of the type, in these also. As the writer has no good specimen of the variety, on the last points he is doubtful.

CLAYTONIA ARENICOLA n. sp.

Annual with delicate, fibrous roots, 2–6 inches high: radical leaves linear-spatulate, the broadest not over 2½ lines wide (generally about a line wide), 1–2 inches long, tapering from near the obtuse apex into a delicate petiole; cauline leaves a single pair, similar to the radical but shorter, opposite and distinct: racemes numerous and prolifically flowered, the flowers on pedicels ½–¾ inch long; petals pink-white, 3 lines long, emarginate; seeds ½ line long, shining and resembling those of *C. Sibirica* but only half as large.

Dry, sandy banks along streams as well as dry pine woods,

Mo. Bot. Garden

Idaho and Eastern Washington. This plant has been referred for me to *C. spathulata* var. *tenuifolia* Gray. I am convinced that this ought not to go into *C. spathulata* Dougl., for throughout this whole country the cauline leaves are never united but spatulate-linear. The flowers are also much larger and in much looser racemes than in this species. Prof. E. L. Greene has sent me a species very near this, only differing in the shape of the cauline leaves, the leaves in his specimen being linear and slightly enlarged at the base, while in this species they are invariably *spatulate-linear.* I should not think this enough to found a species upon and separate it from his species, which he names *C. gypsophiloides* Fisch. & Meyer, were it not that Dr. Gray says (Proc. Amer. Acad. **22**: 282) that *C. gypsophiloides* F. & M. is the same as the *type* of the species, viz.: *C. spathulata* of Douglas. Relying upon this, I give this plant of mine the specific name of *arenicola*. If it proves that Dr. Gray is wrong and Prof. Greene right, this name of mine would probably sink into a synonym of *C. gypsophiloides.*

UNIVERSITY OF IDAHO.

Buxbaumia aphylla L.

Buxbaumia aphylla is generally considered a rare moss, and from its large and peculiar capsule it could not escape notice if it were at all common. My friends Messrs. Chas. E. and Edwin Faxon inform me that usually single plants, or at most two or three together, have rewarded their patient search. But this December it has been very abundant, particularly in the Blue Hill region, and in one locality of less than 200 feet square I counted the following patches of it: Nine of about one inch square containing from ten to fifteen plants each; one of three by two inches of seventy plants; one of two by four inches of eighty-one plants; three patches each about as large as my hand crowded with plants, of which one contained two hundred and eighty specimens. I was reminded of the pictures of a Roman legion under its testudo shields marching to attack a walled town. The locality where these are growing was burned over in a wood fire eighteen months ago, and the soil is yet charred from its effects, and nine months later what underbrush had started was pretty effectually cut off by the Park Commissioners, so that the conditions under which these plants grew were different from any they would have found there in the past fifteen years that I have known the place. I would be very glad to know if anyone has ever found this moss in such abundance. GEO. G. KENNEDY.

READVILLE, MASS.

Herbert A. Young.

The news of the death, at Toledo, Ohio, December 8, of Herbert A. Young, formerly of Revere, Mass., will be received with regret by his many friends in this vicinity. He early in life became interested in botany, and in 1882 published the "Flora of Oak Island," a botanical station in the vicinity of Boston, familiar to botanists since the days of Jacob Bigelow. He later became interested in the sedges, grasses and mosses, and contributed largely to these sections of the *Flora of Middlesex County, Mass.*

He was a good scholar and a keen botanist, but in recent years the demands of his profession as a civil engineer, and later as an officer of the Mexican Central Railway, have prevented his giving much attention to his favorite study. He passed away at the early age of thirty-seven, but he had already accomplished a work that entitles him to the esteem and remembrance of the botanists of Boston and vicinity. WM. P. RICH.

BOSTON, December 26, 1894.

Proceedings of the Club.

TUESDAY EVENING, DECEMBER 11TH, 1894.

The regular meeting of the Club was held in the lecture room of the new building of the College of Pharmacy, 115 West 68th street. The evening was very stormy. Vice-President Allen occupied the chair and there were forty-eight persons present.

The Committee on Membership reported favorably upon the nomination of Mis Harriet B. Elder, of 515 Lexington avenue, City, who was unanimously elected an active member.

Mr. Lighthipe reported the transfer of the Club's herbarium to its new quarters in the College of Pharmacy building.

The paper of the evening was then presented by Dr. Rusby, on "Pharmaceutical Botany."

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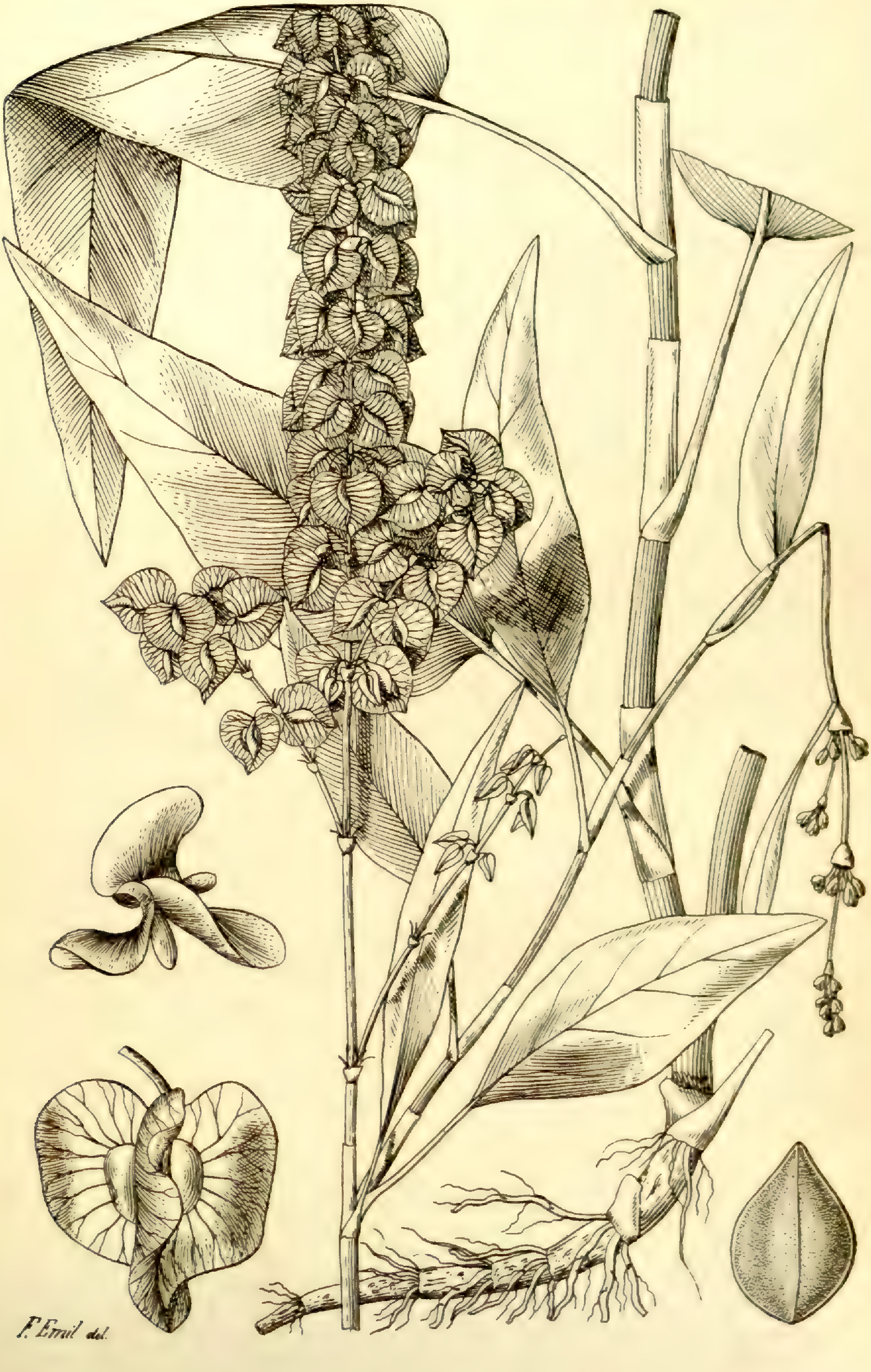

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EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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OF THE

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Vol. 22. Lancaster, Pa., February 20, 1895. No. 2.

New Species of Ustilagineae and Uredineae.

By J. B. Ellis and B. M. Everhart.

Ustilago Washingtoniana E. & E.

On leaves of some grass, State of Washington, spring of 1892 (E. R. Lake).

Sori linear, 1 mm.–2 cm. long, covered at first by the lead-colored epidermis, soon exposed and then mass of spores nearly black. Spores globose, 8–10 μ diam., olive-brown, minutely echinulate and filled with numerous small nuclei. The sori are sunk in the substance of the leaf, which is finally eaten away and perforated by them.

Closely resembles *Ustilago longissima* (Sow.), but the spores are larger and minutely echinulate.

Entyloma arnicalis E. & E.

On leaves of *Arnica cordifolia*, Latah county, Idaho, July, 1893 (C. V. Piper, No. 122).

Spots amphigenous, deep rusty brown above, paler below, subangular, 2–4 mm. diam., with a pale yellow shaded border. Sori subepidermal. Spores spherical, hyaline at first, then pale brown, 10–12 μ diam., with a smooth epispore 1½–2 μ thick. Conidia (*Ramularia arnicalis* E. & E. Proc. Acad. Nat. Sci. Phil. 1891, 85) hypophyllous subcylindrical 15–20×2½–3 μ, 2–3-nucleate, the upper end mostly a little curved, borne on subfasciculate hyphae 12–20×2½–3 μ.

Uromyces pulchellus E. & E.

On leaves and petioles of *Silene?* sp. Lake Chelan, Wash. Aug. 1892 (Lake & Hall).

III. Sori scattered or circinate, mostly hypophyllous, small (½ mm.), naked, nearly black. Teleutospores obovate or elliptical, becoming chestnut-brown, 22–28×18–22 μ, epispore smooth, rather thick, moderately thickened at the rounded apex. Pedicels 35–50 μ long, stout, hyaline. There was no indication of any *Aecidium* on the specimen examined.

Uromyces caricina E. & E.

On leaves or culms of *Carex scoparia*, Alcove, N. Y., July, 1893 (C. L. Shear, No. 81). II. & III.

Sori scattered, oblong, ½–1 mm. long by about ⅓ mm. wide, covered by yellowish epidermis, not confluent. Uredospores sparingly mixed with the teleutospores in the same sori, ovate or elliptical, pale, tuberculo-echinulate, 20–22×14–16 μ. Teleutospores obovate, pale below, rounded at the apex, or often with a distinct hyaline papilla, epispore smooth, strongly thickened and dark colored at the apex, 19–23+14–16 μ. Pedicels yellowish, about as long as the spores.

Uromyces Caricis Pk. has naked cinnamon-colored sori and larger spores.

Puccinia trifoliata E. & E.

On *Tiarella trifoliata* Seattle, Wash. June 1892 (Prof. C.V. Piper).

I. Aecidium on the slightly swollen stems and petioles. Erumpent, closed at first, soon open and cup-shaped, about ½ mm. diam., thin, margin toothed. Spores ovate or subglobose, 15–20 μ diam., yellowish, epispore slightly echinulate, amphigenous.

II. Uredo sori small, pale cinnamon color, ⅓–½ mm. diam., naked above. Uredospores obovate or globose, 15–22 μ in the longer diam., rather closely echinulate, hyaline, becoming pale brown.

III. Teleutospores in larger (1 mm.) nearly black naked sori, elliptical, 22–35×15–20 μ. pale chestnut brown, rounded at each end, contents granular, scarcely constricted at the septum, epispore scarcely thickened at the apex, and when examined dry, under a high power, covered with a network of raised lines. Pedicels very short, almost wanting.

Differs from the other related species on *Tiarella* and *Saxifraga* in the presence of *Uredo* and also in other particulars.

Puccinia substerilis E. & E. [N. A. F. 3141.]

On *Chrysopogon* sp. Fort Collins, Colo., March, 1894 (C. F. Baker, No. 219).

Mostly hypophyllous. Sori (II. and III.) superficial, pulvinate, elliptical, black-brown, ½–1 mm. long, naked. Uredospores echinulate, globose or elliptical, 20–30×18–22 μ, brownish-black, epispore nearly equally thickened throughout; pedicels slender hyaline, subpersistent, 20–30 μ long. Teleutospores (in the same sori as the uredospores), oblong or clavate, pale, constricted at the septum, 22–30×12–15 μ, epispore smooth, mostly not at all or only slightly thickened at the rounded or subtruncate apex.

The uredospores are abundant and well developed, while the teleutospores are few in number and apparently not well matured.

This is quite distinct from *P. omnivora* E. & E. and from *P. Chrysopogi* Barcl.

PUCCINIA OMNIVORA E. & E. [N. A. F. 3049.]

On *Chrysopogon nutans*, leaves and stems, Newfield, N. J., autumn 1893.

II. and III. Uredospore sori minute, narrow, 1–2 mm. long, at first covered, then rupturing the epidermis and discharging the yellow, globose or subelliptical, 18–22 μ, subechinulate spores.

III. Sori amphigenous, but mostly hypophyllous, oblong or linear, 1 mm.–1 cm. long, ⅓ mm. wide, at first covered, but soon bare and margined by the ruptured epidermis, nearly black. Teleutospores elliptical to oblong, 22–40×12–16 μ, scarcely constricted, mostly rounded at each end, but those in the center of the sori narrower and paler, and gradually attenuated into the stout, 50–70×4–6 μ, yellowish-hyaline pedicel, upper cell darker, and in the shorter, elliptical spores mostly rounded at the apex without any distinct papilla, the narrower, paler spores with a distinct yellowish-hyaline obtusely conical papilla, epispore smooth, distinctly thickened at the apex.

Has the habit of *P. graminis*, but the spores are decidedly smaller, both the uredo and teleutospores.

PUCCINIA MAGNOECIA E. & E.

On leaves of *Aster pulchellus*, Mts. above Lake Chelan, Wash., Aug. 1892 (Lake & Hall).

III. Teleutospores slender-clavate, 40–50x14–16 μ, pale-brown, almost hyaline below, epispore smooth, much thickened at the apex and darker, slightly constricted, crowded in broad (2–3 mm.), bullate, nearly black, hypophyllous sori, which are partly covered by the epidermis. The upper surface of the leaf is marked by reddish-brown spots corresponding to the sori on the opposite side. The spores are mostly regularly rounded at the apex, but sometimes obtusely pointed or even truncate. Pedicels about as long as the spores.

Differs from *P. Asteris* in its large, dark sori.

PUCCINIA PHILIBERTIAE E. & E.

(*P. Gonolobi* Rav. var. *Philibertiae* Pk. in M. E. Jones' list of western plants, not described.)

On leaves and follicles of *Philbertia viridiflora?* Britton and Rusby, near Las Cruces, New Mexico, Oct., 1892 (E. O. Wooton, No. 43).

Amphigenous, but mostly hypophyllous. Sori hemispherical, dark chestnut brown, ½–¾ mm. diam., superficial, mostly circinate around a compact central group of several confluent or connate sori; on the follicles the sori are densely crowded, covering the entire follicle, which is thus dwarfed and rendered abortive. Teleutospores elliptical or obovate, 20–30×15–20 μ, scarcely constricted, rounded and obtuse at the apex, lower cell a little paler and often narrowed at the base, epispore smooth, scarcely thickened at the apex, contents of the cells granular. Pedicels slender, subhyaline, 55–65 μ long. Mesospores abundant, mostly smaller.

PUCCINIA ZIZIAE E. & E.

On leaves of *Zizia cordata*, Pullman, Wash., September, 1893 (Prof. C. V. Piper, No. 164).

III. Amphigenous but mostly epiphyllous. Sori small (¼–½ mm.), not confluent, nearly black, soon naked; seated on small (1–2 mm.), whitish, irregularly shaped spots, which are often confluent. Teleutospores obovate, elliptical or oblong-elliptical, 22–30×15–20 μ, only slightly constricted; epispore smooth, rather thin or only slightly thickened at the rounded apex. Pedicels hyaline, about as long as the spores.

Differs from *P. bullata*, in its darker sori, smaller spores and, as far as yet known, in the absence of any *Aecidium*.

PUCCINIA NIGROVELATA Ell. & Tracy.

On *Cyperus strigosus*, Mississippi (Tracy). II & III.

Uredospores in short (1–2 mm.), oblong-elliptical sori, surrounded by the erect margin of the ruptured epidermis, ovate or elliptical, pale yellowish, aculeolate, 15–24 (mostly 15–20)×12–15 μ, mass of spores cinnamon colored. Teleutospores in flat sori, 1–3 mm. long, ¾–1 mm. broad, closely covered by the epidermis, which appears black by translucence, clavate-oblong, 35–55×14–18 μ, broadly constricted, lower cell pale and narrowed to the pedicel, upper cell broader and darker, epispore smooth, thickened at the apex, which is either rounded or obtusely pointed, with or without a hyaline papilla. Pedicels mostly shorter than the spores. The teleutospore sori at length open by a longitudinal crack along the middle.

PUCCINIA CLADII Ell. & Tracy.

On *Cladium effusum*, Ocean Springs, Miss., Aug., 1889 (Prof. S. M. Tracy). II. & III.

On the culms and peduncles of the cyme. Sori small, elliptical, subconfluent, so as often to envelope and cover the peduncles for 2 or more cm. in extent; at first covered, then bordered by the ruptured yellowish epidermis. Uredospores ovate or elliptical, 22–25×20 μ, or subglobose, 18–20 μ, at first hyaline, then deep red-brown (or ferruginous-yellow while lying in the sori) aculeate. Teleutospores in similar but much darker colored sori, clavate or oblong, 45–60×18–22 μ, constricted, deep brown, lower cell narrower and paler, epispore smooth or slightly granular-roughened above, strongly thickened at the obtusely rounded apex, or with an oblique papilla, or sometimes subtruncate-flattened. Pedicels shorter than the spores, hyaline or slightly colored, stout. The uredospores are also pedicellate.

PUCCINIA GRANULISPORA Ell. & Galloway.

On stems and leaves of *Allium cernuum?* Montana, 1890 (Prof. F. D. Kelsey).

II. and III. Sori linear, ¼–1 cm. long, shorter on the leaves, ½ mm. wide, at first covered, then exposed by a longitudinal cleft in the epidermis, but only slightly prominent. Uredospores subglobose, pale, faintly echinulate, 20–30×15–20 μ. Teleutospores oblong, clavate or obovate, 45–60×20–25 μ, smooth, with granular contents, slightly constricted, upper cell subglobose or elliptical, darker, moderately thickened at the rounded or obtusely pointed or often truncate apex, lower cell paler, cuneate. Pedicels shorter than the spores, colored. Mesospores not abundant, shorter, obovate, 20–23 μ long.

Differs from *P. Porri* in its linear sori and larger teleutospores.

AECIDIUM CYLINDRICUM E. & E.

On leaves of *Houstonia angustifolia*, Osborne, Kansas, June, 1894 (C. L. Shear).

Spermogonia? Aecidia hypophyllous, subseriate along each side of the midrib, white, cylindrical, about 1 mm. high, margin minutely subfimbriate-dentate. Spores orange-red, angular-globose, smooth, 18–22 μ. The upper side of the leaves is more or less blackened and papillate from the projecting bases of the aecidia.

Differs from *Aecidium houstoniatum* Schw. in its elongated, cylindrical aecidia.

Contributions to American Bryology—IX.

By Elizabeth G. Britton.

(Plates 229–231.)

I. The Systematic Position of Physcomitrella patens.

It must have occurred to every student of the mosses of the United States that the foot-note* at the bottom of page 39 of Lesquereux and James' Manual indicated a curious state of classification, and this feeling is increased when a study of the specimens and literature convinces him that the facts which have been taken for fixing arbitrary lines are still open to question and have been disputed by several well-known bryologists. The questions in doubt are these:—Has *Physcomitrella patens* a dehiscent, differentiated, lid? and is it distinct generically from *Aphanorhegma?* We propose to answer both these questions in the affirmative.

The history with regard to European specimens is best shown by the following citations:—

Physcomitrella patens (Hedw.) Br. & Sch.

Phascum patens Hedw. Descr. **1**: 28. *pl. 10* (1787).

Physcomitrella patens Br. & Sch. Bryol. Eu. 1: *pl. 3* (1849).

Aphanorhegma patens Lindb. in Ofv. K. Vet. Akad. Forh. 580 (1864).

Limpricht (Rab. Kryptfl. **4**: 174. 1886) and Braithwaite (Brit. Mosses, **2**: 127. 1890) maintain *Physcomitrella* as a genus and state that the capsule is indehiscent, or the lid not differentiated; hence the former places it among the cleistocarpous mosses, and the latter, following Lindberg and Hampe, classes it with the Funariaceae. The latter is undoubtedly its most natural alliance. Lindberg claims to have seen the lid. Schimper in the last edition of the Synopsis Muscorum (1876) says that he has not seen it.

> "De operculi vestigi a Clarissimo Lindberg laudato adhuc nil vidi."

---

*"*Aphanorhegma serratum*, Sulliv., differs from this species (*Physcomitrella patens*) only in the regular dehiscence of the capsule, which divides in the middle and is therefore considered as operculate or stegocarpous, though no discoloration nor any kind of modification of the texture is observable on the line of disruption. But for this regular dehiscence *Aphanorhegma* should be described here merely as a variety of *Physcomitrella patens*. It is therefore a remarkable connecting link between the Ephemereae and the Physcomitrieae, which resemble each other also in the areolation of the leaves."

We have taken pains to see all the available American material of *Physcomitrella patens* in the Sullivant herbarium as well as in that of the Department of Agriculture and others. In Drummond's Southern Mosses, No. 5, collected near St. Louis, the specimens are still in perfect condition for examination. Many of the capsules have not split, but several of those which have show with a low magnification a perfectly circular rim. Under a high magnification, after boiling and mounting, the walls are torn irregularly, but a distinct median line of separation, where the cells are elongated with longer transverse walls, was seen, even on the irregularly torn capsules.

No. 30, Sull. & Lesq. Musci Bor. Am. Ed. 2 (1865), collected in Ohio, also are in fine condition. Few of the capsules have split, but after mounting in glycerine jelly, three capsules did split regularly in half, and although we have seen no differentiation of the cells along the suture, yet from its regularity, we suspect it is there. It is almost impossible to determine this after the dehiscence of the capsules, as the walls are so thin, the cells so tender, that in boiling to get rid of the spores, the walls are injured beyond possibility of examination. The stomata are basal, and seem partly immersed.

In Sullivant's own herbarium we found specimens from Columbus, Ohio, collected in 1852, several capsules of which had split regularly in half as seen by reflected light with a low power.

Quite recently we have received from Fort Snelling, Minnesota, specimens collected by Grace E. Sheldon on October 1, 1894, which show a differentiation of the cells around the middle of the capsule. Fig. 8 of our plate was drawn from these specimens. These capsules are very fresh and young, the cells of the walls still contain chlorophyll, and are more distinct than any we have seen. Starting from the stomatose base, the longest diameter of the cells is vertical, they measure .013×.027 mm., gradually the cells become larger, still keeping their longest diameter vertical, and twice the length of the shortest, measuring .027×.054. At the line of dehiscence the cells are transversely elongated, three times longer than wide, and measures .016×by .054 mm.

Taking the above observations only for what they are worth, it seems to me that we may at least give the question the benefit of a doubt, and would advise any one having access to fresh material of this rare and interesting species, and who is familiar with modern laboratory methods, to do some careful bleaching and staining, and try to prove conclusively whether *P. patens* belongs with the Cleistocarpous mosses or not.

The stomata as figured by our artist do not agree with fig. 59 of Limpricht's Laubmoose (Rab. Kryptfl. 4: 158), but in all our specimens they seem to be more or less immersed, and it is only in deep focussing that the outlines appear distinct.

There seems to be some uncertainty as to the position of the antheridia in *Physcomitrella patens.* Schimper in the Bryologia (*t. 3*) figures them in basal buds, but in the Synopsis Muscorum (Ed. 2, 1876) he corrects himself, saying they are axillary to the upper leaves. As in *Aphanorhegma* they have also globose-tipped paraphyses.

Limpricht says they may be either naked and pseudolateral under the perichaetium or on a branch, seldom at the base of the vaginule; the paraphyses may be thread-like or globose-tipped. We have not been able to verify any of these statements from fresh American material.

The genus *Aphanorhegma* was founded by Sullivant in 1848 (Gray's Man. Ed. i., 647. 1848). *Physcomitrella* was not published till 1849 (Br. & Sch. Bryol. Eu. fasc. 42). In his search after earlier names, Lindberg seems to have allowed dates to have more weight than facts. From the accompanying plates and descriptions, it seems to me that we cannot consider *Physcomitrella patens* and *Aphanorhegma serrata* as congeneric, much less is one "merely a variety of the other."

Description of Plate 229, Physcomitrella patens (Hedw.) Br. & Sch.

1. Plants, natural size.
2–3. Two enlarged, showing the immersed capsules.
4. Outlines of leaves.
5. Half of the base of one leaf enlarged, showing cells.
6. Apex enlarged.
7. Capsule enlarged, showing the stomatose base, and irregular line of dehiscence, the parenchymatic walls and large apical cells.
8. Cells of the walls still further enlarged, showing the transverse elongation of those in the middle of the capsule, the hexagonal ones above.
9. Apex of capsule enlarged.

10. Spore.
11. Same much enlarged, snowing the spines.
12. Stoma, enlarged, showing the overlapping cells.
13. Calyptra.

Description of Plate 230, Aphanorhegma serrata Sull.

1. Plants, natural size.
2. Same, enlarged.
3. Outlines of leaves.
4. Cells at base of one side of leaf.
5. Cells of the apex.
6. Perichaetial leaves removed, showing the antheridia mixed with the archegonia in the upper axils.

6–7, Distinct antheridial clusters.

8. One of the globose-tipped paraphyses.
9. Leaves removed, showing the subapical innovations of the stems and the nearly sessile capsules.
10. Single capsule enlarged, showing median dehiscence and flaring rim.
11. Spores, one enlarged, showing spines.
12. Collenchyma cells below the mouth showing the thickened walls.
13. Cells of lid.
14. Two stomata enlarged.
15. Calyptra.

2. On a Hybrid growing with Aphanorhegma serrata Sull.

(Plate 231.)

These specimens were distributed in Drummond's mosses of the Southern States (1841) as No. 20, labelled as follows:

Schistidium serratum, nov. sp.

Foliis obovatis acuminatis sub apicum serratis, capsula hemisphaerica.

Near St. Louis, growing with *Phascum serratum.*

In the set belonging to the Columbia College Herbarium, there is an unmistakable hybrid between *Aphanorhegma serrata* and an unknown *Physcomitrium*, probably *P. turbinatum*, though, of course, the hybrid is not characteristic, as the archegonial plant was *Aphanorhegma*, and the antheridial plant was not distributed and could not be as easily determined.

Aphanorhegma serrata ♀ × *Physcomitrium turbinatum* ♂ (?).

Schistidium serratum Hook. & Wilson in Drummond's Southern Mosses no. 20 (1841).

Plants 3–5 mm. high, gregarious, bushy; stems branching and rooting at base of the innovations; leaves crowded, 2–3 mm. long, lanceolate or oblanceolate, from an oblong base, margins serrate above, marginal cells inflated with oblique walls; vein ending below the apex, or excurrent into the subulate tip. Sporophyte of two kinds. The normal, immersed ones of *A. serrata*, splitting in half when mature, becoming broadly flaring, with several rows, 8–10, of dark collenchymatic cells bordering the mouth and forming the whole of the lid; the spores rough, .024–.027 mm. The hybrid sporophytes exserted; seta 2–6 mm.; capsule turbinate, not splitting in the middle, but with a smaller apical lid, which is bordered by one row of denser cells and is composed of parenchymatic cells, as well as the walls of the capsule; mouth bordered by two rows of dense oblong cells, and a persistent well-differentiated annulus; spores .016–.018 mm., immature.

Type locality near St. Louis, Missouri; type specimen No. 20, Drummond's Southern Mosses, in the Herbarium of Columbia College.

I wrote to Kew for information concerning Hooker and Wilson's specimens, and Mr. Wright says they also have a mixture in Drummond's No. 20, but he does not mention any exserted capsules. "Some of the plants have broad leaves, similar to those of *Phascum patens*, as is shown by Sullivant in Mem. Acad. n. ser 3:60. *t. 11* (1848) and in Sullivant's Icones, *t. 57*. Others have longer, narrower leaves, and an almost sessile capsule, with a regular operculum. On another specimen (13b, Mississippi, Drummond) Wilson has written 'In this tuft is also found *Phascum patens*.'"

Drummond's specimens were supposed to be the ones on which Sullivant founded his genus *Aphanorhegma*, but it is clear, on consulting his herbarium, that his set of Drummond's mosses could not have supplied the figures which are given in the Memoirs of the American Academy (3: 60. *t. 2*. 1848), for he had only a few old ragged plants of No. 20 with deoperculate capsules. He distributed in the Musci Alleghanienses No. 198 (1846) specimens from Virginia and Ohio, as *Schistidium serratum*, and in the original description of *Aphanorhegma* in Gray's Manual he makes no mention of Drummond's specimens, and gives the distribution "from New England to Ohio." These must be the types of the genus, and the ones figured in the Icones Musc. *t. 57*.

Description of Plate 231.

All the plants taken from Drummond's Southern Mosses, No. 20.

1. A plant of *Aphanorhegma serrata* bearing three normal capsules, old, immersed and empty, with a flaring mouth, broader than the depth of the capsule; the spores measure .024–.027 mm., and are rough and brown.

1a. Hybrid sporophyte, with exserted seta 6 mm. long, the capsule not splitting in the middle, but with a smaller lid, the mouth bordered by two rows of cells and an annulus, the spores imperfect, .016–.018 mm.

2. A plant of *Aphanorhegma serrata* with one old, flaring, immersed capsule, spores .024–.027 mm.; to the left, on a separate branch, two younger capsules, immersed and immature.

3. The lower plant is *Aphanorhegma serrata* with a single immersed flaring capsule, the spores .027–.029 mm.

3a. Another immersed, flaring capsule with mature spores .027 mm. in diameter.

3b. Four other branches, all bearing exserted capsules, less flaring than the other two and bordered by only two rows of cells with a distinct annulus, the spores imperfect and massed together in the sporesac.

3d. was found in place on 3c., but in boiling it fell off. It will be seen that the cells of the lid are quite different from that of Fig. 6.

4. A simple, unbranched plant of *Aphanorhegma serrata*, showing the shape just after dehiscence.

5. Same, enlarged, showing the 8 rows of thick, collenchymatic cells bordering the mouth.

6. Lid of same, enlarged; also composed of collenchyma.

7. Spores spinosely roughened, .024–.027 mm. from Fig. 4.

8. A normal plant of *Aphanorhegma serrata* with two capsules, one old and flaring, the spores .024–.027 mm., the other just splitting in half, with the calyptra still on.

3. On a European Hybrid of Physcomitrella patens.

There has been recorded in Europe another hybrid which makes a curious parallel between *Aphanorhegma* and *Physcomitrella*, and it seems to have puzzled European bryologists, for they do not agree in the interpretation of the facts. The synonymy is as follows:

PHYSCOMITRELLA HAMPEI Limpr. (Rab. Kryptfl. 4: 175. 1886).

Physcomitrella patens × *Physcomitrium sphaericum.*

Physcomitrella patens var. *pedicellata* Br. & Sch. Br. Eu. *t. 3y* (1849).

Ephemerum patens var. *anomalum* Hampe in sched.

Aphanorhegma patens var. *anomalum* Hpe.; Lindb. in Ofv. K. Vet. Akad. Förh. 580 (1864).

Physcomitrella patens var. *anomala* Hpe.; Milde in Bryol. Sil. 191 (1869).

Milde says of it that the capsules are long-stalked with unmistakable indications of a lid. These specimens were collected at Blankenburg in the Harz Mountains by Hampe.

Schimper, Hampe, Lindberg, Braithwaite, Husnot, Sullivant and Lesquereux and James (our American authorities probably cited the European) all state that *P. patens* may have the capsules either immersed or exserted, and Boulay states that it is very variable and that the different forms may be found growing "pell-mell" in the same locality.

Limpricht, in a foot note to his description of *P. Hampei*, says that Lindberg claims to have seen this form in the axils of the leaves of *P. patens* but that he has never seen it.

We have a slight addition to make from our own observations, for in the Jæger Herbarium we find authentic specimens of Hampe's labelled: "Ephemerum patens var. anomalum. Seta exserta. p. Blankenburg. Ex. herbar. E. Hampe, 1865." These specimens show what Limpricht says he has not seen, two kinds of capsules on the same plant.

One plant which we have mounted has two capsules; the lower one small, immersed, with thin walls and characteristic large apical cells of *Physcomitrella patens*. The other is exserted on a thick seta 2 mm. long, with regular distinct cells in the walls of the capsules and a differentiated lid. The exserted capsules are almost all either young or aborted, so that no spores have been seen, but one old capsule has been found with the lid off, showing the mouth bordered with an orange-colored rim of cells and a distinct annulus. The immersed capsules are on the lower part of the plants, as in our hybrid; most of the capsules are older and have perfected their spores with measure .024-.027 mm. and are rough.

Japanese Characeae—II.

By T. F. Allen.

11. *Chara coronata* Ziz., collected in Province Ise, differs in no essential point from the forms of Nos. 2 and 3.

12. *Nitella Japonica* Allen, from a new locality in Province Ise, namely Yamagami; distributed with No. 14, under the exsiccatae number 9.

13. NITELLA PULCHELLA sp. nov.

Nitella polyarthrodactyla, monoica, gloeocarpa.

Stems about 460 in diamater. Verticels consist of eight or nine leaves (with an occasional simple, undivided leaf, but not heterophyllous.) Leaves about 150 in diam., thrice divided, primary segment much longer, (2680); first node bears 6–7 secondary segments, 68 diam., 600 long; second node bears 5 tertiary segments, 34 in diam., 175 to 200 long; occasionally one of these divisions is undivided like a simple terminal with three cells; the third node bears four to six (usually four) two-celled terminals, 25 diam., 170 to 240 long. The terminals are two (rarely 3) celled, the cells about equal in length; the terminal cell is not mucroniform, but terminates, rather abruptly, in a sharp point (some collections more elongated and slender); other specimens, terminals very short, forma brachyteles. The fertile verticils are somewhat compact and borne upon pedicels arising from the stem within the primary verticils; the entire fertile verticil becomes a globular, gelatinous mass. The leaves of the fertile verticil are usually *twice* divided, the antheridia borne on the second node are about 225 in diam., and decidedly stipitate, the stipes 200 long and 54 in diam. The oogonia are borne on both nodes of the leaf, single; usually on the terminal node, sessile, the coronula minute.

The oospore, dark reddish, is 250 long, 200 broad, with 7–8 prominent ridges, the surface is strongly reticulated, the reticulae 5–12 in diam.

The relationship of this beautiful species is not clear, in some features it may be related to *N. trichotoma* A. Br., but it is clearly separated from it as well as from the subspecies *Zeyheri* and *Lechleri*.

It may be considered remotely similar to *N. gelatinosa* A. Br., of Australia, where species of the polyarthrodactylae-gloeocarpae section most abound, but this species remains quite unique and individual.

No. 14, *Nitella Japonica*, additional collections, more mature, from Yamagami, Province Ise, distributed as exsiccatae No. 9.

No. 15, NITELLA SUBGLOMERATA JAPONICA *var. nov.*

Verticels consist of a large number of leaves, often 12 to 16, apparently irregularly in a double series, some longer, some shorter, but all twice divided; the first node bears three oogonia and three secondary divisions, the second node also bears three oogonia and three terminals; rarely one of the secondary divisions does not form a node, but remains as a simple one-celled terminal; the terminals of the second node, usually three in number, are one-celled and acuminate above the middle, terminating in a sharp point which is solid.

The oogonia are aggregated, three together, at each node of the leaf, not closely sessile, with a rather large and persistent coronula, the lower cells of which appear to be spreading, as in some sub-species of the polyglochin group, in all from 350 to 400 long. The oospore is marked with 6 striae, 204 long, 180 to 190 broad. The membrane of the spore is strongly reticulated, the reticulae averaging 5 μ in diameter. This Japanese form differs mainly in the somewhat smaller spores, which are much more strongly reticulated; the antheridia also are smaller, 200 in diam. This species was collected in Mikawa, Seishin pond, and distributed as No. 15 of my Japanese exsiccatae.

No. 16. NITELLA SUBLUCENS sp. nov.

Nitella diarthrodactyla, homoeophylla, monoica macrodactyla, subflabellata, gymnocarpa. Fertile verticils contracted into dense terminal or axillary heads, long overtopped by the sterile leaves; verticils very dissimilar. The long sterile leaves are surmounted by a crown of about four minute two-celled leaflets. Fertile leaves twice- rarely thrice-divided, terminal segments usually four, short, two-celled, the lower of the two cells inflated, theterminal cell a sharp mucro, oogonia clustered at the base of the fertile verticils and at the first node of the leaves; oospore, 285 long and broad, globular, six or seven striate. The present specimens are too immature to determine the character of the membrane of the spore. Antheridia about 200 in diameter.

This species is closely allied to *N. translucens* (Pers.) Ag; from which it differs by its smaller size, and especially the much smaller oospore (and its locality).

This species was collected in Sagami, Kodsu, and distributed as No. 16 of my Japanese exsiccatae.

17. *Chara gymnopitys* A. Br. var. "*alpha*" A. Br.

This form, though not exactly corresponding to *gymnopitys genuina* A. Br., seems to be on the border between that and var. (*beta*) *duriuscula* A. Br., both from Australia; and as A. Braun has left var. "Alpha" blank, it may well be occupied by this variety. The stems are about 306 in diam., with small, conical, broad-pointed spines; leaves about 8, stipules 16, the cortex cells double, alternately large and small, often with additional, partially developed cells, so that sections show about 20 cortex tubes; bracts at the leaf-nodes equally developed all around, slender, long, acuminate-pointed, about 60 in diam. The oogonia seem to be distinctly stipitate, the oospores average 560 long by 365 to 390 broad, with 8 (10–11) striae. The coronula is short, broad and square-shaped. Antheridia are rather rarely found, 293 in diam.; when present, conjoined.

This species was collected in Mikawa, Tennu pond, and distributed as No. 10 of my Japanese exsiccatae.

No. 18, same species and variety as the last, collected in Tokio, Shinbashi pond, and distributed as No. 11 of my exsiccatae Japonicae. Nos. 19, 20 and 21, *Nitella pulchella* Allen, collected respectively in Chikubushima pond, Mikawa Tennu pond, and Tokio Shinbashi pond, and distributed as Nos. 13 and 14 in my exsiccatae Japonicae.

As a matter of record it may be well to add that the following list of Exsiccatae Japonicae has been distributed as far as specimens would allow; of *N. sublucens* Allen only fourteen specimens could be sent out.

CHARACEAE JAPONICAE EXSICCATAE.

DISTRIBUTAE A T. F. ALLEN.

I

1 Chara fragilis Desv.
2 Nitella coronata Ziz.
3 Nitella coronata Ziz.
4 Nitella Japonica Allen.
5 Nitella mucronata A. Br.
var. tenuior A. Br.
6 Nitella Japonica Allen.
7 Nitella orientalis Allen.
8 Nitella pulchella Allen.
9 Nitella Japonica Allen.
10 Chara gymnopitys A. Br.
var. "alpha" A, Br.
11 Chara gymnopitys A. Br.
var "alpha" A. Br.
12 Nitella paucicostata Allen.
13 Nitella pulchella Allen.
14 Nitella pulchella Allen.
15 Nitella subglomerata A. Br.
var. Japonica Allen.
16 Nitella sublucens Allen.
17 Nitella oligospira A. Br.

Tradescantia Virginica var. villosa Watson.

There are doubts whether this is a variety of *Tradescantia Virginica* L. or should have specific rank. Forms are found which apparently connect the extremes and make it difficult to draw the line of separation. As the two are found growing in company at Forest Hill, in the southern border of Chicago, and where they are clearly distinct, I have had a good chance to observe them for several years in their native condition. I first met with the variety in 1878, and have watched it more or less since. At that time it was not easy to refer this low or dwarf plant, broad leaved, green and early maturing, to *Tradescantia Virginica* as described in the books, usually a much taller, smooth, narrow-leaved and glaucous plant, which kept on flowering throughout the summer. Still more than their different look, it was their early flowering and disappearance which particularly called attention to them. Rafinesque, in the species which he made out and gives in his "New Flora and Botany of North America," calls some "vernal" and others "estival."* This holds good between the two found here. Notes made in 1878 give the time of gathering as May 30th. Those of 1880 state that hundreds were examined on June 11th, and none were in flower, all having gone to seed. *Tradescantia Virginica* was then fairly in its season of bloom, only a few having passed that stage. May 12, 1894, a few of the low kind were found in flower; on the 21st they were in great abundance. At the latter date but three of the other form were found in flower after a long search. On June 19th half a dozen flowers of the low form were discovered after a search of an hour or more in spots where the plants were most numerous. The taller form was then in full bloom everywhere. The stems of the low form were mostly dead or dying, some lying flat on the ground. Their season was virtually over. A number of plants of *T. Virginica* were seen in flower August 16th. The last one observed was on August 29th, except a single plant on October 2d, probably a case of flowering the second time. The broad leaved form behaves like a vernal plant, early in the season maturing its buds for the coming year, its aerial parts then disappearing, a process mostly completed by the last of June. Some of the other form will have passed their floral season then, but others keep up the succession so that they are common or even abundant in July. I have as yet detected the low kind in but one locality, while the other grows in profusion wherever the conditions are suitable.

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*l. c. p. 84 ff.

The two do not intergrade here, something which might be expected where they are so intimately associated in some places that both forms can be taken up with the same handful of earth, with their roots intermingling. Hence there is little difficulty in distinguishing each, their involucral leaves in most cases being at once decisive. Sometimes the typical form becomes low, and occasionally pilose, generally in poor soil or in the sand region, but it preserves the main characteristics of the plant, and rarely deceives one.

As found here the following descriptions will give their points of similarity or difference:

TRADESCANTIA VIRGINICA L.

Plants glaucous, stems single or clustered, 1–5 feet high, generally 1½–3 feet, simple, or frequently branched, smooth. Leaves channeled, narrow, linear to linear-lanceolate, scarcely ciliate except at base, the sheaths and base of the leaves on the lower part of the stem sometimes pilose. Involucral leaves mostly shorter than the stem-leaves, generally much shorter, often abruptly contracted from an ovate base, which usually sheaths the umbel when in bud. Umbel simple, many flowered. Peduncles and calyx smooth. Flowers blue, varying to purplish blue. Roots coarsely fibrous, variable in color, whitish to yellow.

Abundant in open woods, fields and borders of woods.

May–August.

T. VIRGINICA L. var. VILLOSA Watson.

Plants green, rarely glaucous, stems single or oftener clustered, 2–15 in. high, mostly 5–10 in., simple or occasionally branched, sometimes flexuose, smooth or hairy. Leaves flattish, prominently nerved, broadly linear to linear lanceolate, ciliolate, hairy or roughish with short hairs, especially the upper, the lower becoming smooth or smoothish. Involucral leaves usually longer and broader than the stem leaves, ½–1¼ in. wide, gradually tapering from the base, which scarcely or not at all sheaths the simple, many flowered umbel. Peduncles and calyx villous. Flowers commonly purplish-blue, varying to blue. Roots coarsely fibrous, yellow, often deep yellow.

Woods or borders of woods, frequently in rather dense woods.

May–June.*

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* Torrey (Flora of the Northern and Middle Sections of the United States, 1824, 335), describes *T. Virginica* as if he had this form in hand. He says the stem is "about a foot high," the involucrum "large, 2-leaved," "flowers pubescent." May is given as the time of flowering. He adds, "My specimens are from Lake Michgan."

CHICAGO, ILL.

E. J. HILL.

Some new Hybrid Oaks from the Southern States.

BY JOHN K. SMALL.

(PLATES 232–235.)

The following is a record of some observations on several interesting forms of *Quercus* growing in North Carolina and Georgia, together with a striking hybrid existing in two well-marked forms, found in Lake county, Florida, by Mr. Geo. V. Nash, during his collecting trip of last season.

QUERCUS PHELLOS × Q. DIGITATA.

A large and stout tree with rough scaly bark, reaching a height of from twenty to thirty-five meters, and having a trunk diameter ranging from six to nine decimeters. Trunk forking several feet from the ground, the divisions thence branching, the branches rather erect and the branchlets straggling; leaves oblong, obovate or oblanceolate, 5–20 cm. long, 2–10 cm. broad, mostly entire and undulate or somewhat crisped, or more or less two-lobed or three-lobed near the apex, acute or obtuse at the apex, acute, obtuse or subcordate at the base, the upper surface dark-green and glabrous, the lower brown and more or less tomentose with reddish brown, stellate hairs, especially about the midrib and principal nerves; mature fruit not seen. (Plate 232.)

Hills west of the Falls of the Yadkin River, North Carolina.

In 1892 I found a small grove of peculiar looking oak trees in a very shallow depression in the foot-hills of the Falls Mountains, just west of the Falls of the Yadkin River, in Stanley county, North Carolina. Specimens were collected, but there was not time for a thorough investigation of the case. The specimens suggested a form of *Q. Rudkini* (*Q. Phellos* × *Q. nigra*), and some were distributed under that name. Each succeeding year I have observed the trees and their surroundings, and am now confident that the parents are not those of *Q. Rudkini*, but *Q. Phellos* and *Q. digitata*, the two prevailing species of the immediate region. *Q. nigra*, one of the undoubted parents of *Q. Rudkini*, was not observed within several miles. The form of *Q. digitata*, which is apparently one of the parents of the hybrid under consideration, is not that with long, falcate leaf-lobes, but one common through the pine woods in the middle country of the Southern States. Its leaf is not as deeply lobed and has a more cuneate outline. As in the case of the following hybrid, this one produces on the same branches leaves almost identical in shape with those of the parents. Many, however, are intermediate, in various degrees resembling one or the other of the parent forms. The texture is about intermediate, and the pubescence on the lower surface less than in *Q. digitata* and much more than exists in true *Q. Phellos*.

The cup and acorn, although not mature, each exhibit characters which suggest *Q. digitata* rather than *Q. nigra*. Most of the trees noticed had the peculiar habit of forking about three feet from the ground into two erect secondary trunks. This character, together with the striking irregularity in the shape of the foliage, makes the trees quite conspicuous among their associates.

QUERCUS GEORGIANA × Q. NIGRA.

A small tree of a dark-green color and a somewhat straggling mode of branching, ranging from three to ten meters in height and having a trunk diameter varying from ten to twenty-five centimeters clothed with a dark, smooth, glabrous bark, which becomes rough on the trunk. The leaves are mostly obovate in outline, sometimes oblong, 4–20 cm. long, 2.5–15 cm. broad, 3–5-lobed, dark green and shining above, brown and dull beneath, glabrous on both surfaces, except a small tuft of stellate hairs in the axils of the nerves on the lower side, obtuse or acute, equilateral or inequilateral at the base, the sinuses either shallow or deep, sometimes penetrating almost to the midrib; the lobes rounded or square-oblong and slightly lobed at the ends, all ending in a slender apiculation; fruit 12–15 mm. long, 13–16 mm. broad, short-stalked, peduncle 4–6 mm. long; cup saucer-shaped or slightly turbinate, reddish, the scales triangular, the acorn depressed-globose, pubescent, sometimes sparingly striped, ending in a short, abrupt apiculation. (Plate 233.)

Northern slope of Stone Mountain, DeKalb county, Georgia.

On the northern slope of Stone Mountain, at an altitude of about 1300 feet, there is a grove of stunted trees of various species of oaks, *Quercus Georgiana* and *Q. nigra* predominating. I had been in the grove a number of times, but noticed nothing peculiar until January, 1894, when my attention was called to some odd shaped leaves on the ground and anomalous acorns on the branches overhead. This material suggested a hybrid form. Last September I visited the same spot to secure fresh foliage from the trees and make some further observations.

Q. Georgiana and *Q. nigra* were the only species in the immediate vicinity, and the trees in question appear intermediate between the two. In place of the graceful port of the preceding species there was a certain amount of the rugged habit of the latter. The texture of the foliage is intermediate, and leaf forms suggesting both species occur on the same branches. Mature fruit also has traces of the characters of that of both the parents. The accompanying plate gives some of the extreme leaf forms.

QUERCUS CATESBAEI × Q. CINEREA.

Form A, in which Q. cinerea predominates (*No. 1586*).

A small tree with the habit of *Q. cinerea*, ranging from two and one-half to four meters in height, with a trunk diameter ranging from six to twelve centimeters, branching about one meter from the ground; the branches somewhat spreading, clothed with a smooth, striate bark; the young shoots tomentose with dark-colored trichomes. The leaves are narrowly obovate or oblanceolate, sometimes elliptic or lanceolate, 5–15 cm. long, 2–6 cm. broad, entire, undulate and more or less crisped or partially 3–7-lobed, either on one side or on both, acute or acuminate at both ends, short-petioled or sessile, the upper surface light and very bright green, the lower surface lighter but rather dull and more or less tomentose, the midrib and nerves white but not prominent above, prominent beneath, the lobes short-apiculate; cup hemispheric-turbinate, 13–14 mm. broad, 10 mm. high, nearly sessile. (Plate 234.)

Growing in dry, sandy soil, in high pine lands on the road between Umatilla and Lake Ella (about two miles from the latter place) in Lake county, Florida.

Form B, in which Q. Catesbaei predominates (*No. 1577*).

A small tree, with much the habit of *Q. Catesbaei*, reaching a height of two or three meters and having a trunk diameter of six to nine centimeters, the trunk branching from within 3 or 5 dm. of the ground, the branches more spreading than in the former. Branchlets conspicuously marked with white lenticels, the young twigs white-tomentose; leaves mostly oblong in outline, sometimes obovate, 6–15 cm. long, 3–10 cm. broad, usually 5–7-lobed, sometimes 2–3-lobed or nearly entire, more or less irregular and inequilateral, acute or obtuse at the base, short-petioled, the lobes narrow, acute and apiculate by a long, sharp bristle, somewhat tomentose beneath, the nerves prominent and conspicuous on both surfaces. Flowers and fruit not seen. (Plate 235.)

Grows in dry, sandy soil in high pine lands, on the road between Umatilla and Lake Ella (about three-fourths of a mile from the latter place) in Lake county, Florida.

Family Nomenclature.

By Dr. V. Havard.

Much credit is due Mr. Barnhart for taking up and elaborating this important problem which now forces itself upon the attention of botanists for a satisfactory solution. Uniformity and stability in family nomenclature are as desirable and necessary as in genera and species, and therefore such nomenclature must be built upon secure foundations and placed within the dominion of law.

The advantages of a common ending for all family names are obvious and generally recognized, and the ending most habitually used is *aceae.* There seems to be no valid reason why it should not be applied under all circumstances; it does no violence to logic, grammar or analogy, and there should be no difficulty in sacrificing custom and tradition to law and uniformity.

To this extent I agree with Mr. Barnhart, and I also recognize the wisdom of not going behind the Species Plantarum of 1753.

To his rule that the root of the family name shall always be that of the accepted name of a recognized genus belonging to that family, I am inclined to demur, and would instead offer the following propositions:

1. The name of each natural family shall be the oldest name properly published, changing its termination into *aceae* if otherwise ended.

2. The name shall be properly published, if in Latin, in the plural number, and accompanied with description clearly based upon one or more genera of said family.

My reasons for dissenting are the following:

1. Priority is the fundamental law of nomenclature and must dominate every other consideration. As the original author of a genus name is allowed entire freedom in his choice (within the limits of correct construction) and receives credit for it, so should the author of a family name.

2. Genera are often separated only by minor and secondary characters, so that their limits are variously estimated, and their names accordingly liable to change with the discovery of new species. Should the family name share the risk of this instability?

3. A family name constructed from a genus name logically implies that said genus is the most important, and that the characters of the family are, in the main, those of this genus, while in reality the genus may be one of the least important and materially differ in its structure from that of other genera, *e. g.*, *Cassiaceae*, which is proposed for *Leguminosaceae* and *Carduaceae* for *Compositaceae*.

4. A family name should, so far as possible, describe a character common to all or a great number of genera in the family, and this seems to have been the praiseworthy aim of several of the distinguished authors to whom we owe the existing nomenclature. The fact that plants of other families may have the same character does not matter; there can be no hard and fast line in classification. For this reason I prefer *Cruciferaceae* to *Brassicaceae*, *Graminaceae* to *Poaceae*, *Coniferaceae* to *Pinaceae*, *Umbelliferaceae* to *Ammiaceae*, etc., even though it is true that umbels are also found in *Araliaceae*, and cruciform flowers in *Capparidaceae*.

5. Our main object being stable uniformity, the rule which will accomplish it with the least disturbance, and preserve the most of the familiar old names should be preferred; if priority is sufficient for the purpose we must reject the more radical and subversive rule of Mr. Barnhart.

Concerning tribal names I presume there is no question that they should invariably be formed from the root of a generic name with the addition of the termination *eae*, as is the usage of our best authors.

Reviews.

The Life and Writings of Rafinesque.—Prepared for the Filson Club and read at its Meeting, Monday, April 2, 1894. By Richard Ellsworth Call.

Filson Club Publications, No. 10. 4to, broad margins, pp. 227. *plates 5.* John P. Morton & Co., Louisville, Ky., 1895.

This splendid volume, creditable both from a literary and from an artistic standpoint, had its inception, so the preface informs us, in an attempt to clear up certain matters connected with the synonymy of the Unionidae, in which family of molluscs

Rafinesque was much interested and in which he did such valuable work.

The Filson Club is an organization having for its object the collection and preservation of original matter connected with the history of the State of Kentucky, hence the publication of this volume as a recognition of "the first resident professor-naturalist within the limits of the State."

Constantine Samuel Rafinesque [Schmaltz]* was born in Galata, near Constantinople, October 22, 1783. His father was French, his mother of German parentage. His early life was spent in France and Italy, and his first essay, written in 1796, was in the form of a journal, describing a tour to Genoa. That he early had the instincts of a naturalist is manifest, for by the time he was fifteen years old he had made collections of plants, fishes, birds and shells, and apparently took but little interest in boyish sports or games, or in association with other youths of his own age.

His first visit to America was in 1802, and here he remained, mostly in the vicinity of Philadelphia, until 1805, when he returned to Italy. There he remained for a period of ten years, during which time he wrote many papers, dealing not only with matters in connection with his surroundings, but also others based upon his observations and experiences while in America. His domestic life was unhappy, however, and doubtless had much to do with his subsequent eccentric manners. In his description of Sicily he says: "She offers * * * a fruitful soil, a delightful climate, excellent productions, perfidious men, deceitful women." In 1815 Rafinesque left Europe forever and set sail for America once more. His arrival was dramatic in the extreme, and doubtless still further heightened his pessimistic ideas. At midnight, November 2d, in a dense fog, the ship ran aground off Fisher's Island, in Long Island Sound, and all the results of his years of toil, mercantile and scientific, were lost.

He finally came to New York and accepted a position as private tutor in a wealthy family. He soon resigned this position, however, and went to Philadelphia, where he found several good friends and other persons, it seems, who were not, for we hear of him during his stay there as having been bankrupted in a business adventure and defrauded of all his savings by the falseness of a fellow-countryman, to whom he had intrusted his affairs while on his exploring expeditions into what was then called the West, between the Alleghanies and the Mississippi.

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* He added this, his mother's name, for prudential reasons, on his return to Italy, in order that he might pass for an American and thus avoid certain political complications in which he feared he might become involved.

Through the influence of one of his Philadelphia friends he secured an appointment to a professorship in the Transylvania University, at Lexington, Kentucky, upon the duties of which position he entered in the fall of 1819. Here he passed seven busy years, during which time he made extensive collections, especially in conchology and botany, wrote and published many papers, attended to his duties at the University and acted as secretary of the Kentucky Institute—the first scientific society formed within the State. One of his great ambitions seems to have been to found or to assist in the foundation of a botanic garden at Lexington, and in 1823 he presented the matter before the State Legislature with such success that the Senate psssed a bill to that effect, but it failed of passage in the Assembly. He then undertook to push the scheme by means of private subscription and the formation of a joint stock company. An act of incorporation was secured, ground was purchased and planting was actually begun, but those upon whom he relied failed to meet their obligations and the attempt was finally abandoned. This embittered and saddened him still further, and he says: " * * * this garden would have been my delight; I had traced the plan of it, with a retreat among the flowers, a greenhouse, museum and library; but I had to forsake it at last and make again my garden of the woods and mountains."

He does not seem to have been in touch with his associates in the University, who took but little interest in his scientific work, and he was doubtless impatient of their criticisms and indifference. Added to this, the students ridiculed him and finally, in June, 1825, he left Lexington and once more made his way to Philadelphia. During the next fifteen years he seems to have lived in a hand-to-mouth manner, practicing medicine in his own way, lecturing at the Franklin Institute and assisting in the establishing of a savings bank. This latter seems to have met with success, but although it was in existence at the time of his death, his end came to him amidst surroundings of absolute poverty, alone, in a garret in a poor quarter of Philadelphia in 1840.*

His estate consisted entirely of personal property—mostly books, unpublished manuscript and specimens of natural history. The latter had suffered much from his inability to properly care for them, and a large part of his plant collection was sold as waste paper. Eight dray loads comprised the material which he left behind. Some of this is yet preserved in the National Museum; another portion was secured by the University of Pennsylvania through Mr. Isaac Burk, and many of his botanical specimens finally went to the Jardin des Plantes in Paris, and the Philadelphia Academy of Natural Sciences. The final settlement of his estate left it indebted to the administrator in the sum of $14.43.

This, in brief, is the outline of his life as given in the first sixty-nine pages of the volume. Accompanying this are two portraits, one taken from a painting in the collection of the Wisconsin Historical Society, the date of which is uncertain, and another as he appeared in 1810 at the age of twenty-seven, besides which there is a photographic reproduction of one of his letters to DeCandolle, written in 1838.

Following this is a bibliography, arranged in chronologic sequence, enumerating 203 publications, containing 420 titles. It is almost impossible to conceive, in these days of specialization, the wide range of his mental activity of which these give evidence. Botany, Zoölogy, History, Social and Political Economy, Meteorology, Geology, Poetry, Philosophy, Book Reviews, Journals of Travel, Astronomy, Physics, Archaeology, Ethnology, Medicine and other subjects which might be classed as subdivisions of the above, all received his attention.

There is also a chapter devoted to a list of publications in which Rafinesque or his works are mentioned by other authors and an appendix giving a copy of his will, which, in addition to the part describing as to how he wishes his property to be disposed, contains the clause, "I wish my body to be burnt rather than buried, as I do not want to contamine the earth by decay, nor be a cause of desease to other men. My ashes, if they can be collected, I wish to be deposited in a Urn, to be kept with my collections."

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* According to an article by Thos. Meehan, published in the Philadelphia *Public Ledger* a few years ago, the exact date of which is unknown to me, Rafinesque is said to have died September 18, 1842.

Apparently his property and certainly his body, was not disposed of in accordance with either the letter or spirit of this document, and his biographer says that he "appears to have been despoiled of his rights in nomenclature while living; he was despoiled of his possessions when dead."

Many of the most interesting details contained in the volume are necessarily omitted in this review, but attention should be called, at least, to the titled headings, "Rafinesque's Name in Nomenclature," where he is commemorated both generically and specifically in botany and zoölogy; "Medals, Diplomas and Other Honors," in which a list of these, conferred upon him by scientific societies at home and abroad is given; "Rafinesque and Evolution;" "Rafinesque's Literary Style;" "Personal Appearance of Rafinesque," etc.

The volume is a model of its kind and is a fitting tribute to the versatile man whose life it memorializes. A. H.

Annual Report of the State Botanist of New York. Charles H. Peck. pp. 48 (From the 47th Report of the New York State Museum of Natural History, Albany, 1894).

Mr. Peck's report for the year 1893 contains a great deal of important and valuable information. It deals with the poisonous toadstools; gives a list of plants added to the State Herbarium, of which 40 species were not before represented, gives notes on species not before reported in any of his communications, there being 14 new Fungi here described in the genera *Psathyrella*, *Merulius*, *Stereum*, *Discosia*, *Haplosporella*, *Rhabdospora*, *Volutella*, *Cercospora*, *Peziza*, *Sphaerella*, *Clavaria*, *Leptothyrium*, *Zygodesmus*, *Asterula* and *Melogramma*, not all from New York State, however; and under "Remarks and Observations" we find a variety of interesting notes on distribution and on characters of numerous species. Dr. E. C. Howe contributes the description of *Carex Peckii* n. sp., the *C. Emmonsii elliptica* Boott, considering it more nearly related to *C. deflexa* than to *C. Emmonsii*. N. L. B.

Science. This weekly journal of research and discovery, abandoned for some months has been revived under most favorable circumstances and bids fair to give American students a reputable and authoritative medium of rapid and regular publication. It is published under the coöperation of the following Editorial Committee: S. Newcomb, Mathematics; R. S. Woodward, Mechanics; E. C. Pickering, Astronomy; T. C. Mendenhall, Physics; R. H. Thurston, Engineering; Ira Remsen, Chemistry; Joseph Le Conte Geology; W. M. Davis, Physiography; O. C. Marsh, Paleontology; W. K. Brooks, Invertebrate Zoölogy; C. Hart Merriam, Vertebrate Zoölogy; N. L. Britton, Botany; Henry F. Osborn, General Biology; H. P. Bowditch, Physiology; J. S. Billings, Hygiene; J. McKeen Cattell, Psychology; Daniel G. Brinton. J. W. Powell, Anthropology.

Volume I of the new series was begun January 4th, and the seven numbers so far issued are replete with matters of both general and special interest. In these days of extreme specialization and enormous publication, the student tends to confine himself to his chosen sphere of thought, and to know as much as possible about that little sphere, and it would seem in many cases as little as possible about everything else. This tendency has been especially noticable in America, and we may now hope that it will be in large measure corrected by the publication of the journal here noticed.

Manuscript intended for publication and books or papers intended for review should be sent to Professor J. McKeen Cattell, Garrison on Hudson, N. Y. The subscription is fixed at $5.00 a year and should be sent to the Publisher of Science, 41 East 49th St., New York City. We bespeak a cordial support of the enterprise by all American botanists.

Additional Notes on the new Fossil, Daimonelix; its Mode of Occurrence, its gross and minute Structure. E. H. Barbour. Univ. Studies, Univ. Neb. **2**: 1–16. *pl. 1–12.*

This exceedingly interesting contribution to the literature of problematic organisms is the second one on the subject by the author since the original "Notice of new gigantic Fossils," published in Science, **19**: 99–100. *figs. 1–3.* The name has evidently seemed somewhat provincial to the author, so he begins the paper with the modest excuse that it was adopted in deference to the ranchmen and early settlers who used to know the fossils as "Devil's corkscrews," or "fossil twisters." They have been examined by botanists, geologists and paleontologists and have been considered as plants, animal burrows and "accidents." If they are to be classed with the latter, the author justly says: "Such accidents should be immortalized." Sections examined under the microscope, however, show a structure which is cellular but not vascular, and the author concludes that they represent a new order of aquatic plants, "resembling the red sea weeds more closely than anything else." The illustrations are to be particularly commended, as they represent the location of the fossils in the field at a distance, single specimens close to, microscopic sections and a general view of the collection as it appears in the Museum of the University. A. H.

American Algae. Century I. 1894. Josephine E. Tilden, University of Minnesota, Minneapolis, Minn.

The first distribution of this collection of fresh water algae from the upper Mississippi Valley has made its appearance. All the specimens, including some rare forms, are mounted upon good white card paper in a quarto volume. Labels, including descriptive details, are printed, and the material has evidently been determined and arranged with great care. The work as a whole has only commendable features. It will certainly prove to be of great value to the few herbaria who may be fortunate enough to acquire it, as the edition is limited to twenty-five copies.

A. S.

Through Glade and Mead.—Under this attractive title Mr. Joseph Jackson presents a most pleasing account of the flora of of Worcester county, Mass. This large county, extending across the centre of the State, embraces a very diversified topography. We have the high peak of Mt. Wachusett, with a few plants approaching the sub-alpine character; the rocky cliffs of Westminster, the Purgatory Chasm near Uxbridge, and many fine lakes and ponds, swamps and forests. All this region Mr. Jackson has made peculiarly his own. He takes the reader at once into his confidence, and with charming talk by the way leads him to his chosen haunts. He knows the poets well, and culls from them their sweetest thoughts. In these days, when so much of our botanical reading has an aggressive and controversial turn, it is refreshing to escape into the fens and forests. Every page in this book is odorous with wild flowers and tuneful with bees and birds.

The volume is amply illustrated by photogravure impressions of actual Worcester county scenes, or of typical wild flowers. Thus the peat-meadow given opposite to page 196 is enough to fill a botanist's soul with envy; and who would not love to wander through the path in the frontispiece?

The series of familiar papers is followed by a catalogue of the plants thus far found in the county, following the last edition of Gray's Manual as to nomenclature. The author, who is eminently fair minded, says: "In the present state of botanical nomenclature, and for the purpose for which this catalogue is intended, I have not thought it wise or necessary to adopt proposed changes not yet generally accepted. The student in such matters can easily adapt himself to changing conditions."

The press-work and general composition of the book are very satisfactory, indeed elegant. W. W. Bailey.

The Characeae of America. T. F. Allen. Part II. Fascicle 2. Issued December, 1894. Pages 9–17, *plates 8*, species 9, illustrated.

In this fascicle Dr. Allen has described and figured three new species of *Nitella*, *N. Bastini*, *N. dilatata*, and *N. annularis*, and six others are figured and described, *N. capitata*, *N. praelonga*, *N. clavata*, *N. Macounii*, *N. axillaris*, and *N. Morongii*. E. G. B.

List of Pteridophyta and Spermatophyta growing without Cultivation in Northeastern North America. Prepared by a Committee of the Botanical Club, American Association for the Advancement of Science, 8vo, pp. 377. New York, 1893–1894.

This work, originally issued in signatures to members of the committee and such other botanists as expressed a desire for it in that form, is now sent complete, simultaneously with its appearance as Vol. 5, Memoirs of the Torrey Botanical Club.

It had its first definite inception at the Rochester, N. Y., meeting of the American Association for the Advancement of Science in 1892, after the botanists there present had been engaged in an earnest consideration of the principles of plant nomenclature for many years, a subject of discussion in which most American botanists had taken part. An interchange of views between those who were present showed that while there were many differences of opinion in regard to details all were practically agreed as to certain fundamental principles. A committee was, therefore, appointed to prepare a draft of a code, which draft was subsequently presented, discussed, amended and finally adopted. This is now known as "The Rochester Code."

This committee was then continued with power to prepare and print a list of the plants embraced within the area covered by the sixth edition of Gray's Manual of Botany, with the addition of the States of Kansas and Nebraska, and the Canadian Provinces from Manitoba to Newfoundland, in accordance with the principles enunciated in the code. The committee immediately went to work and were able to present the list, in manuscript form, almost complete, at the next meeting of the Club, at Madison, Wis., in 1893.

The committee was then increased by two members, and was authorized to proceed with the printing of the list. Several minor points not determined by the Club, such as capitalization, insertion or omission of commas and use of trinomials, were referred to the committee with power, decided by vote of the members, and the final result is the volume now before us.

That it will meet with the approval of over three-fourths of the working botanists in America, we think there can be no question. The Rochester Code is and has been accepted by such a large majority that it is safe to say no work of magnitude could hope for future success here if based upon different principles. Some of the minor rules adopted in the printing, however, are not yet so generally accepted and may be expected to remain as matters of discussion for some time to come. Commas may be either omitted or retained between the specific or varietal name and the authority; capital letters may or may not be used for specific or varietal names derived from persons or places, etc., and varieties may or may not be written as trinomials. These are minor matters.

What concerns us most nearly is that, unless the citations of date of publication for some of the names should have been wrongly determined, we now have established a permanent basis for our nomenclature, and an amount of condensed study within our grasp, for which all botanists owe the committee a deep debt of gratitude. The labor of this research and of the verifications which were necessary only the members of the committee can appreciate, and we are perfectly willing to forgive, in advance, any errors in this respect which may and probably will be discovered when the list comes to be put into practical use. Each species and variety is given a consecutive number, beginning with 1. *Ophioglossum vulgatum* L., and terminating with 4336. *Ptiloria tenuifolia* (Torr.) Raf., the sequence being in accordance with Engler and Prantl's "Natürliche Pflanzenfamilien." To the list is added an appendix containing references to typographical errors, wrong determinations, changes in synonymy and about fifty additional species.

The committee to whose labors we are indebted consists of N. L. Britton, John M. Coulter, H. H. Rusby, Wm. A. Kellerman, Fredk. V. Coville, L. M. Underwood, Lester F. Ward, Edward L. Greene and Wm. Trelease. A. H.

Proceedings of the Club.

ANNUAL MEETING, TUESDAY EVENING, JANUARY 8, 1895.

The President in the chair and seventeen persons present.

Mr. Leonard Barron and Rev. A. P. Ekman were elected active members.

The following officers were elected for 1895:

President, Hon. Addison Brown; Vice-Presidents, Dr. T. F. Allen, Rev. L. H. Lighthipe; Recording Secretary, Dr. Henry H. Rusby; Corresponding Secretary, John K. Small; Editor, Dr. N. L. Britton; Treasurer, Henry Ogden; Associate Editors, Dr. Emily L. Gregory, Anna Murray Vail, Arthur Hollick, Dr. Byron D. Halsted, A. A. Heller; Curator, Josephine E. Rogers; Librarian, Effie A. Southworth.

Under the reading of communications, a letter was read from Prof. Dr. A. Cogniaux accepting the honorary membership which had been conferred upon him, with warm expressions of appreciation. A communication was then read from Mr. Joseph Crawford announcing the death, on December 6th, of Dr. J. Bernard Brinton. The Secretary remarked briefly on the life and character of Dr. Brinton, and announced that an obituary notice was being prepared which would appear in the BULLETIN. A committee consisting of Dr. Britton and Dr. Rusby was then appointed to draft appropriate resolutions, and to present copies of the same to the family of the deceased.

The death was also announced, by the President, of Prof. E. H. Day, which occurred in Algiers on January 4th. At the same time he remarked upon the high character of the deceased as a scientist, a teacher and a gentleman of refinement. Similar remarks were also made by Mrs. Britton and by Mr. Ogden, and a committee consisting of Mr. Ogden and Mrs. Britton was appointed to draft suitable resolutions and to present the same to the family of the deceased and to the President of the Board of Education of New York City.

The paper of the evening was then presented by Mr. A. A. Heller, entitled "Collecting in Western Texas," illustrated by specimens of the flora.

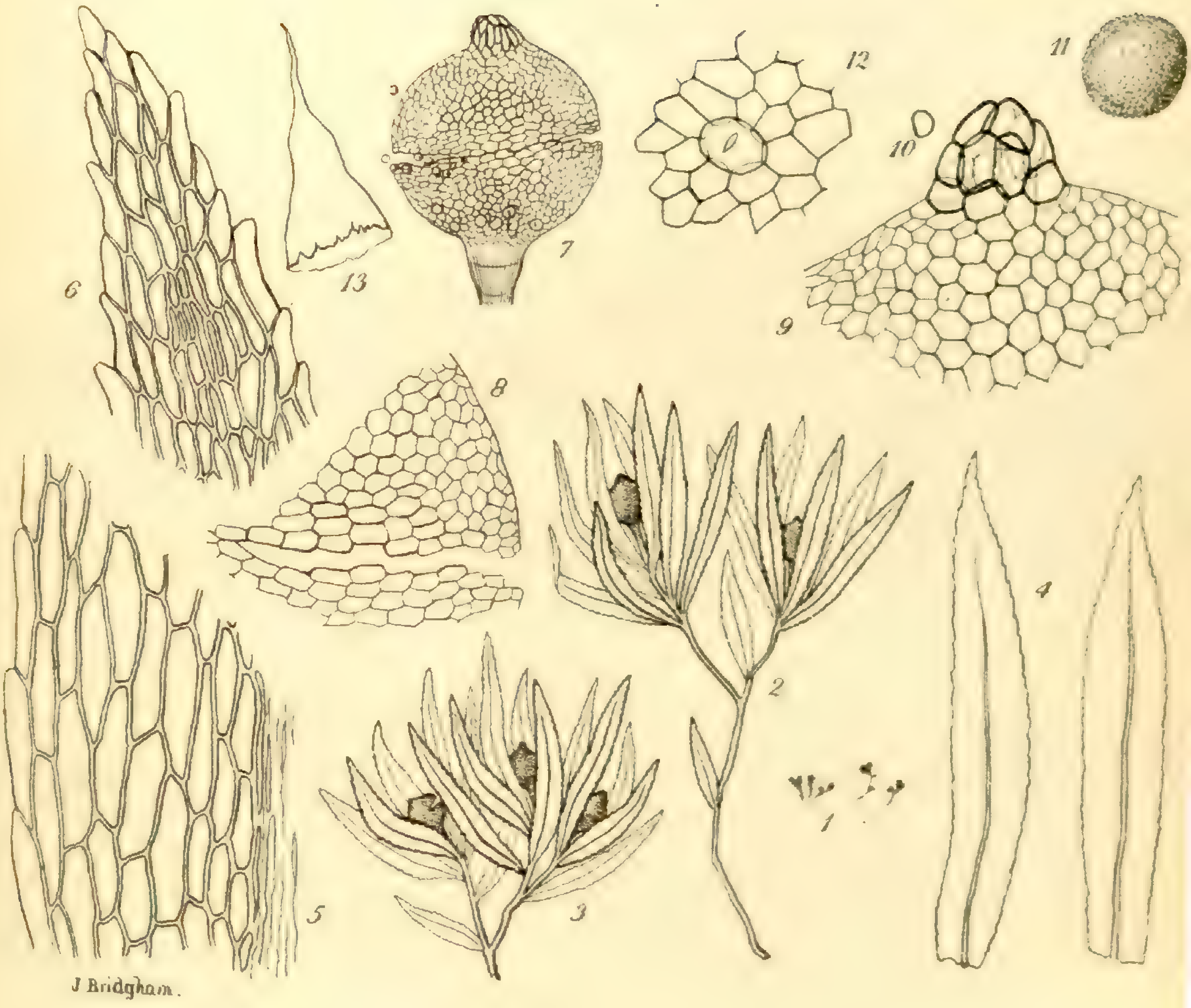
WEDNESDAY EVENING, JANUARY 30, 1895.

The President in the chair and thirty persons present.

Mrs. Annie M. Smith, of 78 Orange street, Brooklyn, was elected an active member.

On behalf of the Committee appointed to draft resolutions concerning the death of Prof. Day, a report was read by Mr. Ogden and a copy placed on file.

The announced paper of the evening, on "Food Plants of the American Indians," was then read by Dr. Valery Havard, and proved to be one of the most interesting and valuable communications presented to the club in recent years. It will be published in a subsequent issue of the BULLETIN.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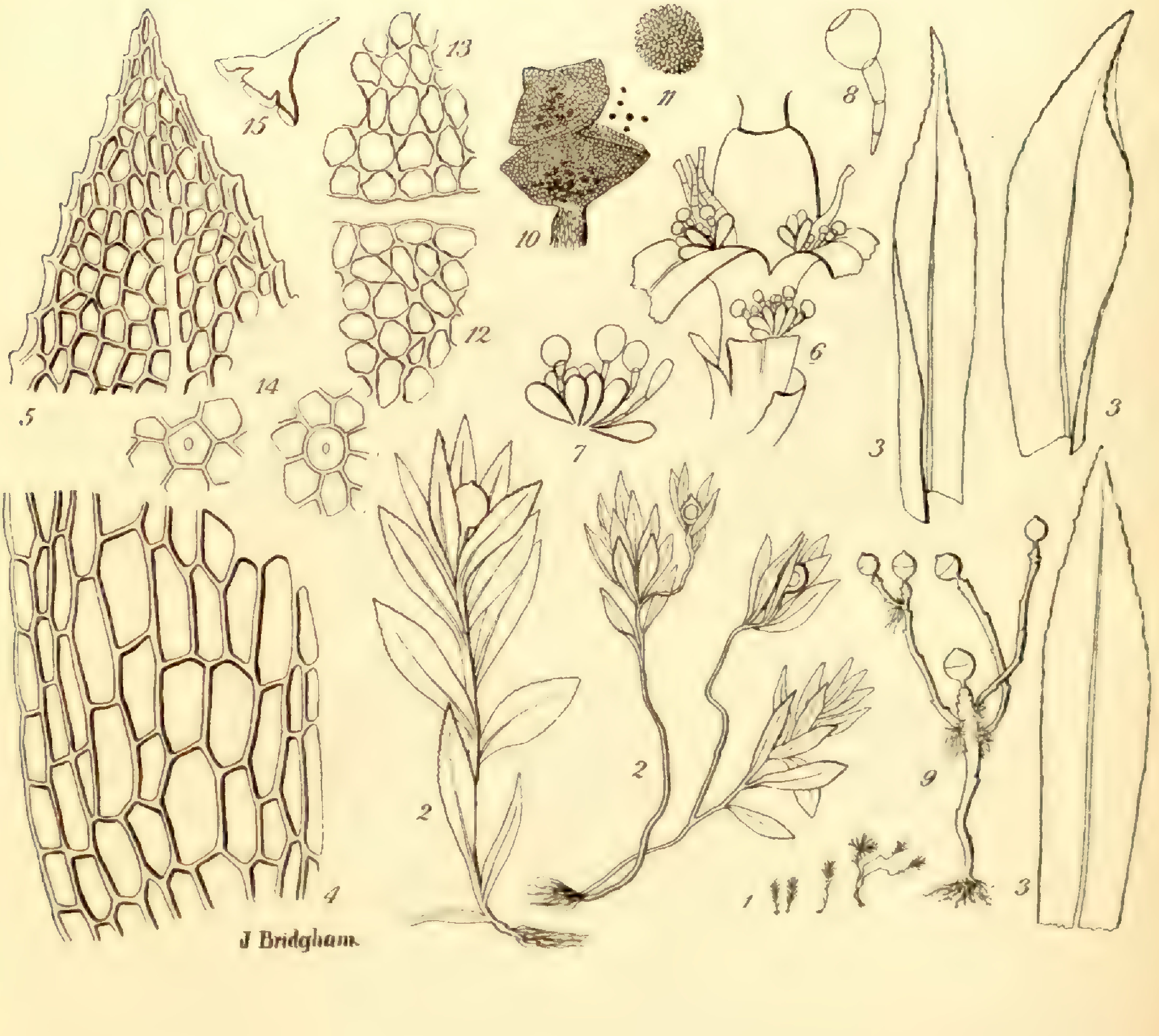
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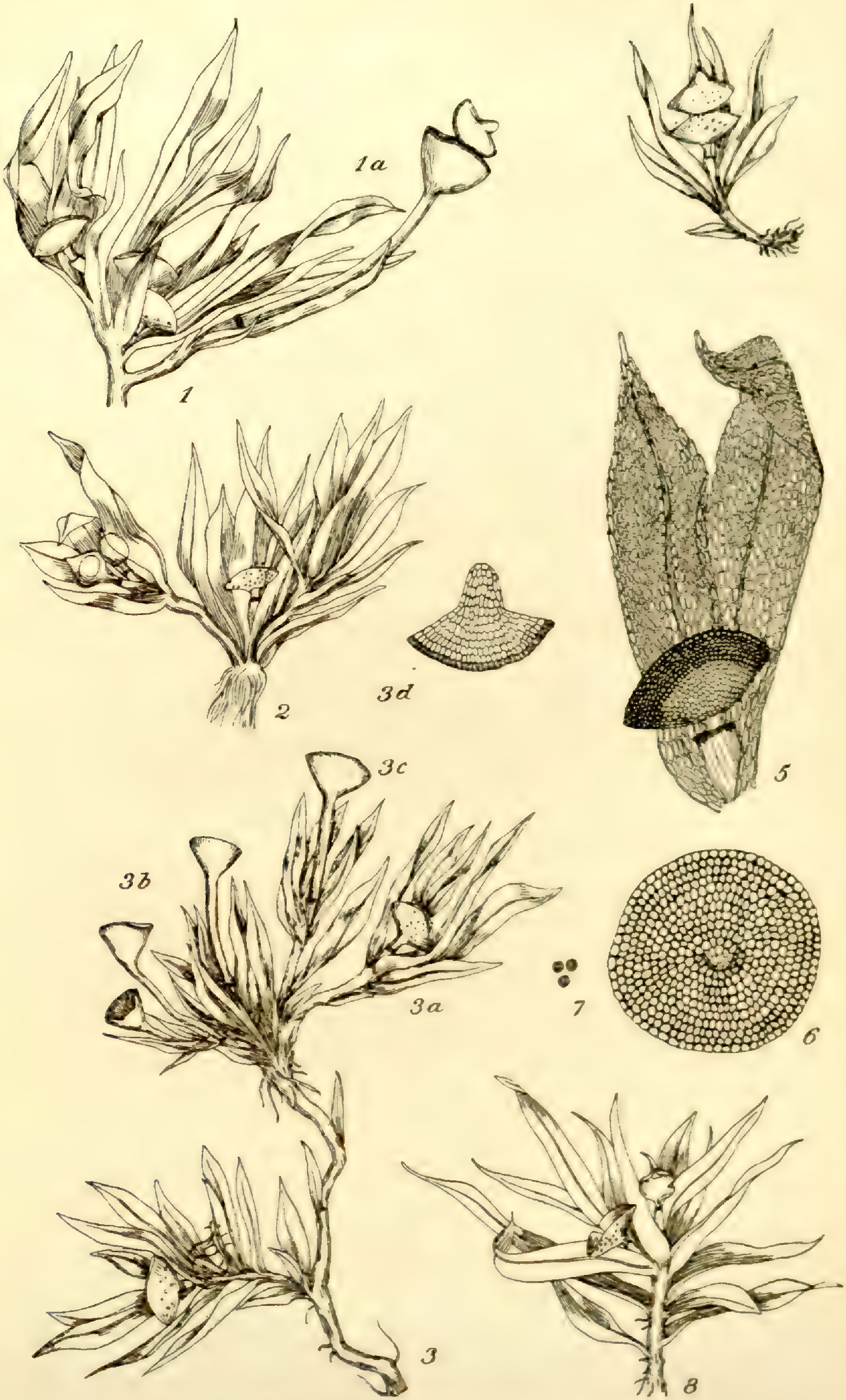
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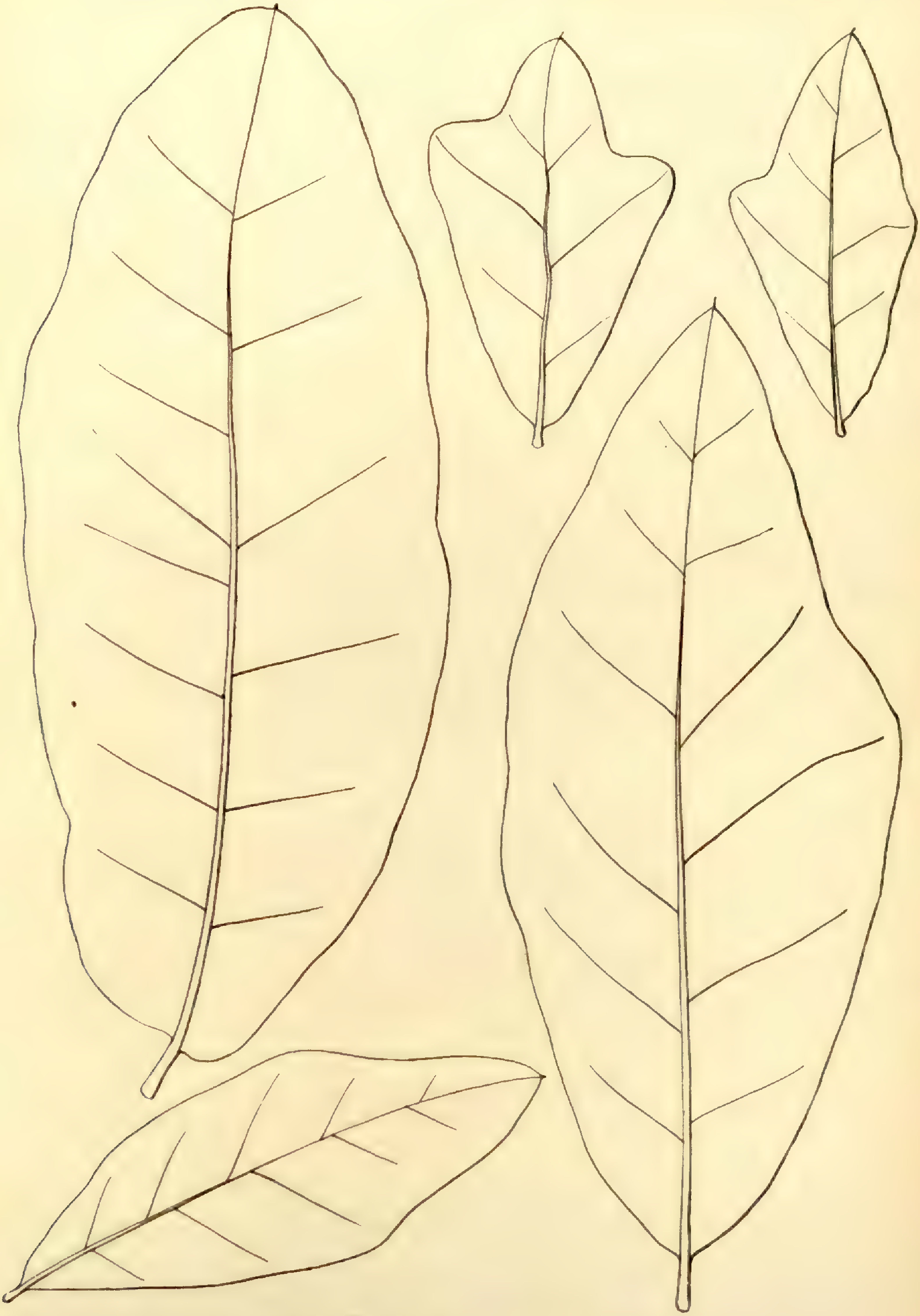
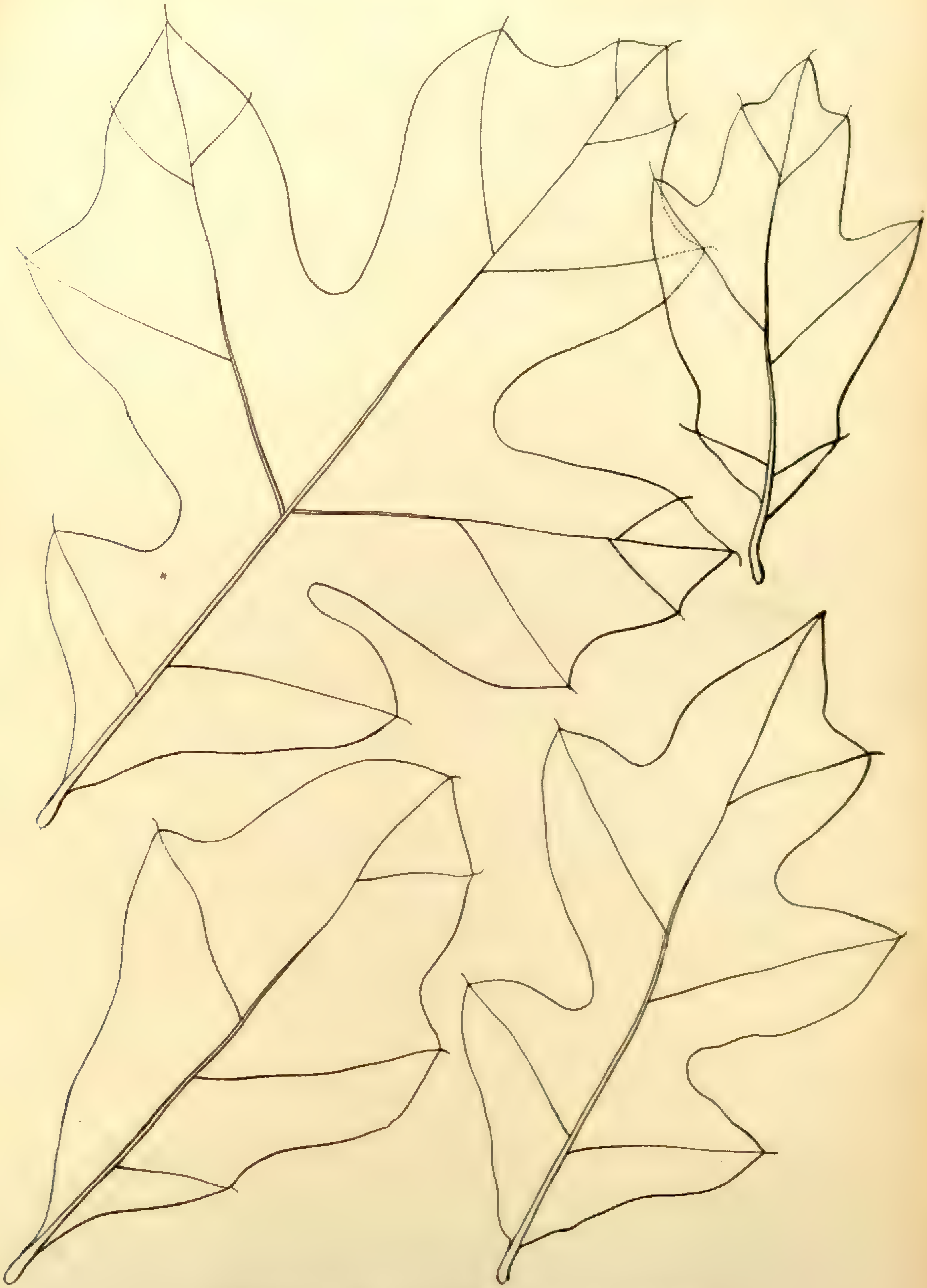
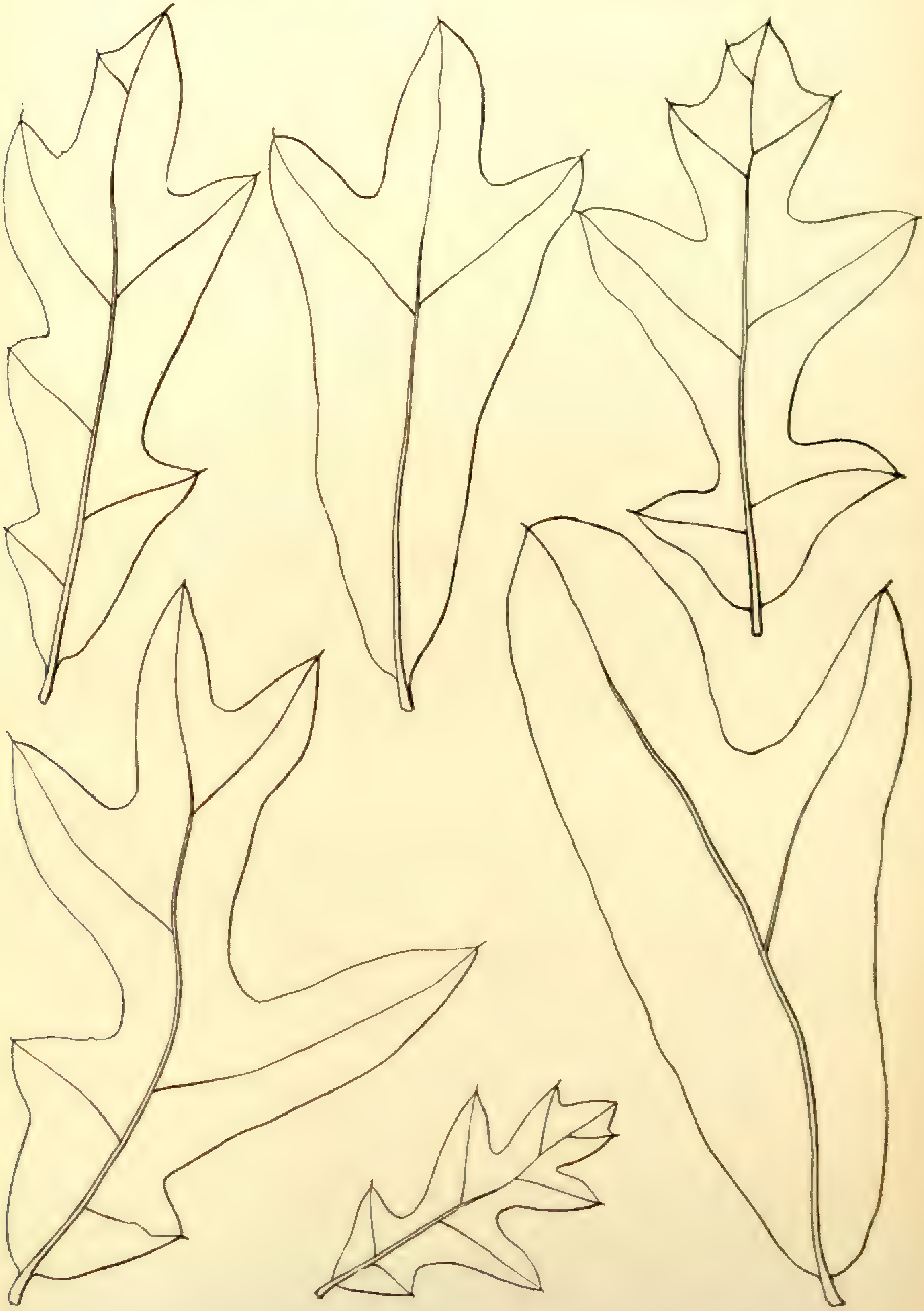
A HYBRID OF APHANORHEGMA SERRATA.



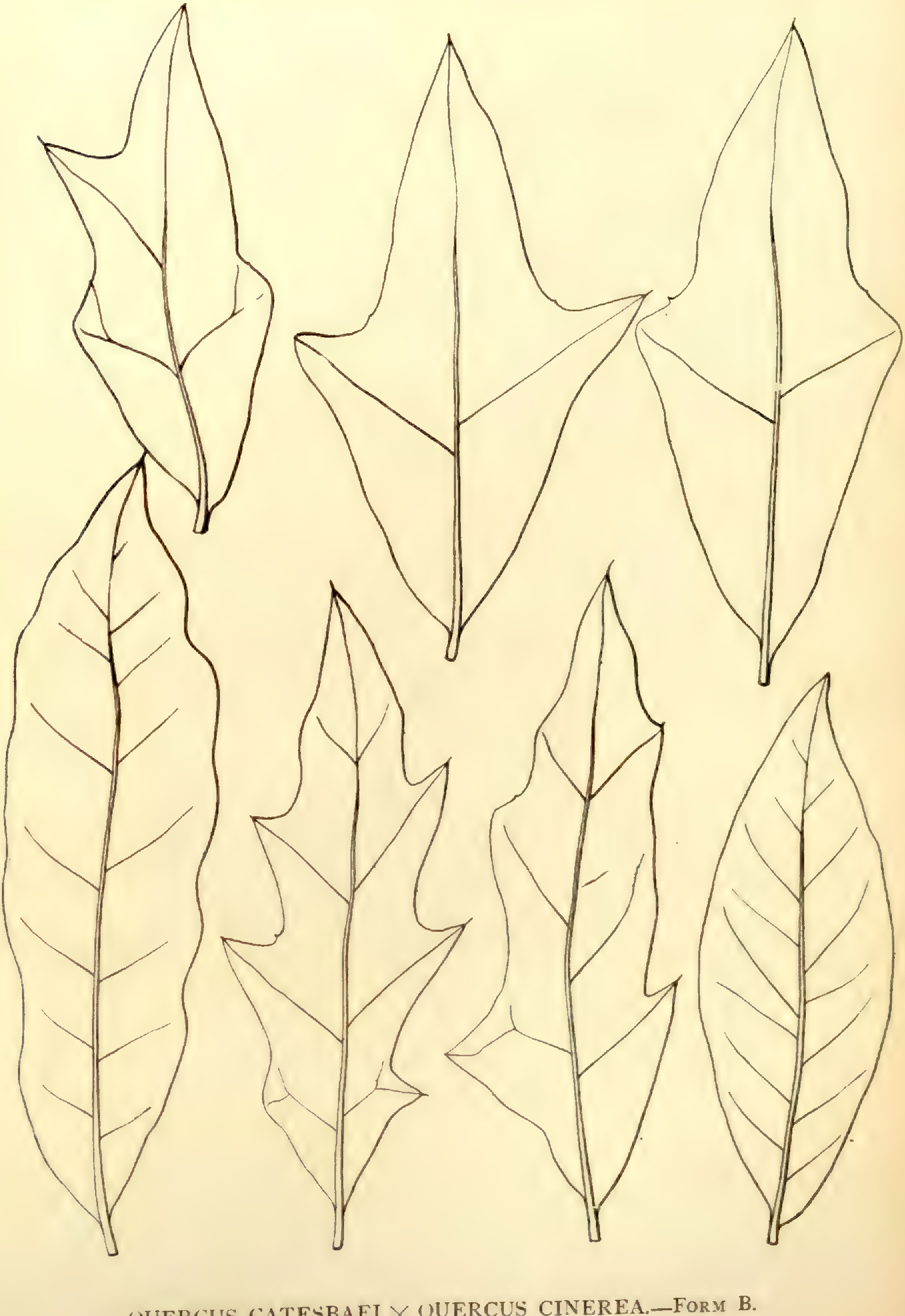
QUERCUS PHELLOS × QUERCUS DIGITATA.



QUERCUS GEORGIANA × QUERCUS NIGRA.



QUERCUS CATESBAEI × QUERCUS CINEREA.—Form A.



QUERCUS CATESBAEI × QUERCUS CINEREA.—Form B.

Index to recent Literature relating to American Botany.

Ayres, H. B. The Muskeag Spruce. Gard. & For. **7**: 504. *f. 80.* 19 D. 1894.

Barbour, E. H. Additional Notes on the new Fossil, *Daimonelix*, its Mode of Occurrence, its gross and minute Structure. Univ. Studies, Univ. Neb. **2**: 1–16. *pl. 1–12.* 1894.

Cross sections under the microscope show these fossils to have been plants with a structure that was cellular but not vascular.

Barnhart, J. H. Family Nomenclature. Bull. Torr. Bot. Club, **22**: 1–24. 15 Ja. 1895.

Bastin, E. S. Laboratory Exercises in Botany. 8vo. pp. 540. *figs. pl. 87.* Philadelphia. 1895.

Designed for the use of colleges and other schools where botany is taught by laboratory methods.

Bastin, E. S. Some further Observations on the Structure of *Sanguinaria Canadensis*. Am. Journ. Pharm. **67**: 4–9. *f. 1–5.* Ja. 1895.

Bastin, E. S. Structure of *Iris*. Am. Journ. Pharm. **67**: 78–83. *f. 1–5.* Ja. 1895.

Bessey, C. E. The Russian Thistle in Nebraska. Agric. Sci. **8**: 286. Je–S. 1894.

Briquet, J. Decades Mentharum novarum. Bull. Herb. Boiss. **2**: 691–709. D. 1894.

Descriptions of a large number of proposed new varieties in *Mentha*, some of them American.

Briquet, J. Sur un singulier *Hyptis* brésilien. Bull. Herb. Boiss. **2**: 715–719. D. 1894.

Description and discussion of *Hyptis Glaziovii*.

Britten, J. Jane Colden and the Flora of New York. Journ. Bot. **33**: 12. Ja. 1895.

Bush, B. F. Hybrid Oaks in Western Missouri. Gard. & For. **8**: 32. 23 Ja. 1895.

Carleton, M. A. Uredineae Americanae exsiccatae. Bot. Gaz. **20**: 32. 18 Ja. 1895.

Clendenin, I. *Synchytrium* on *Geranium Carolinianum*. Bot. Gaz. **20**: 29–31. *pl. 4.* 18 Ja. 1895.

S. Geranii n. sp.

Coe, C. H. The so-called Florida Sea-Beans. Gard. & For. **7**: 502–504. *f. 79.* 19 D. 1894.

Coulter, J. M. Formulae for Life histories. Bot. Gaz. **20**: 31. 18 Ja. 1895.

Coupin, H. The Thorns of Plants. Pop. Sci. Month. **46**: 498–501 *figs.* F. 1895. (Translated from La Nature.)

Dietel, P. Die Gattung *Ravenelia* (Nachträge). Hedwigia, **33**: 367–371. 20 D. 1894.

Describes *R. Farlowiana*, *R. Indigoferae* Tranzschel and *R. Mexicana* Tranzschel as new species.

Ellis and **Everhart.** Analytical Key to Ellis and Everhart's North American Pyrenomycetes. Pamphlet, pp. 11 [1894].

Ellis, J. B., and **Everhart, B. M.** New Species of Fungi from various Localities. Proc. Acad. Nat. Sci. Phila. 1894: 322–386. 30 N. 1894 (reprint).

Fawcett, W. Two new Orchids from Jamaica. Journ. Bot. **33**: 12. Ja. 1895.

Descriptions of *Epidendrum tridentatum* and *Pleurothallis uncinata.*

Fawcett, W., Editor. Notes on Castleton Gardens. Bull. Bot. Depart. Jamaica, **1**: 161–200. D. 1894.

Fernald, M. L. *Salix balsamifera.* Gard. & For. **8**: 28. 16 Ja. 1895.

Greene, E. L. *Mimulus luteus* and some of its Allies. Journ. Bot. **33**: 4–8. Ja. 1895.

Henderson, L. F. New Plants from Idaho. Bull. Torr. Bot. Club, **22**: 48–50. 15 Ja. 1895.

Describes *Phacelia Idahoensis* and *Claytonia arenicola.*

Hollick, A. Additions to the Local Flora. Proc. Nat. Sci. Assn. Staten Island, **4**: 55. 12 Ja. 1895.

Hooker, J. D. *Acacia spadicigera.* Curt. Bot. Mag. **51**: *pl. 7395.* Ja. 1895.

A native of Central America and Cuba.

Hooker, J. D. *Cyrtopodium virescens.* Curt. Bot. Mag. **51**: *pl. 7396.* Ja. 1895.

A native of Brazil.

Hooker, J. D. *Erycina echinata.* Curt. Bot. Mag. **50**: *pl. 7389.* D. 1894.

Jenman, G. S. *Adiantum Capellis-veneris* Gard. Chron. **16**: 690. 8 D. 1894.

Note on the occurrence of the species in Jamaica.

Jenman, G. S. *Asplenium Harrisi* (*Euasplenium*). Gardn. Chron. **17**: 69. 19 Ja. 1895.

A new species from Blue Mountain Peak, Jamaica.

Jenman, G. S. *Asplenium* (*Diplazium*) *tenebrosiun* n. sp. Gardn. Chron. **16**: 690. 8 D. 1894.

A new species from Jamaica.

Jenman, G. S. *Pteris* (*Litobrochia*) *regia.* Gardn. Chron. **17**: 39. 12 Ja. 1895.

A new species from Jamaica.

Johnson, D. S. The Crystallization of Cellulose. Bot. Gaz. **20**: 16–22. 18 Ja. 1895.

Keffer, C. A. Black Walnut in the West. Gard. & For. **8**: 12. 9 Ja. 1895.

Keffer, C. A. Green Ash in the West. Gard. & For. **8**: 32. 23 Ja. 1895.

Kennedy, G. G. *Buxbaumia aphylla* L. Bull. Torr. Bot. Club, **22**: 50, 51. 15 Ja. 1895.

Knowlton, F. H. Vanilla and its Cultivation. Pop. Sci. News, **29**: 1, 2. *figs.* Portrait. Ja. 1895.

Kurtz, F. Die Flora des Chilcatgebietes in Südöstlichen Alaska. Engler's Bot. Jahrb. **19**: 328–431. 1894.

Ribes laxiflorum var. *inermis* is described as new, and a long list of species given with localities.

Kurtz, F. Die Flora der Tschuktschenhalbinsel. Engler's Bot. Jahrb. **19**: 431–493. 1894.

A long list of species.

Meehan, T. *Aquilegia Canadensis.* Meehan's Month. **5**: 21, 22. *pl. 2.* F. 1895.

Meehan, T. *Darlingtonia Californica.* Meehan's Month. **5**: 1, 2. *pl. 1.* Ja. 1895.

Meyer, R. Die interessanten Arten der Gattung *Echinopsis.* Monatssch. Kakteenk. **4**: 184–186. *figs.* 20 D. 1894.

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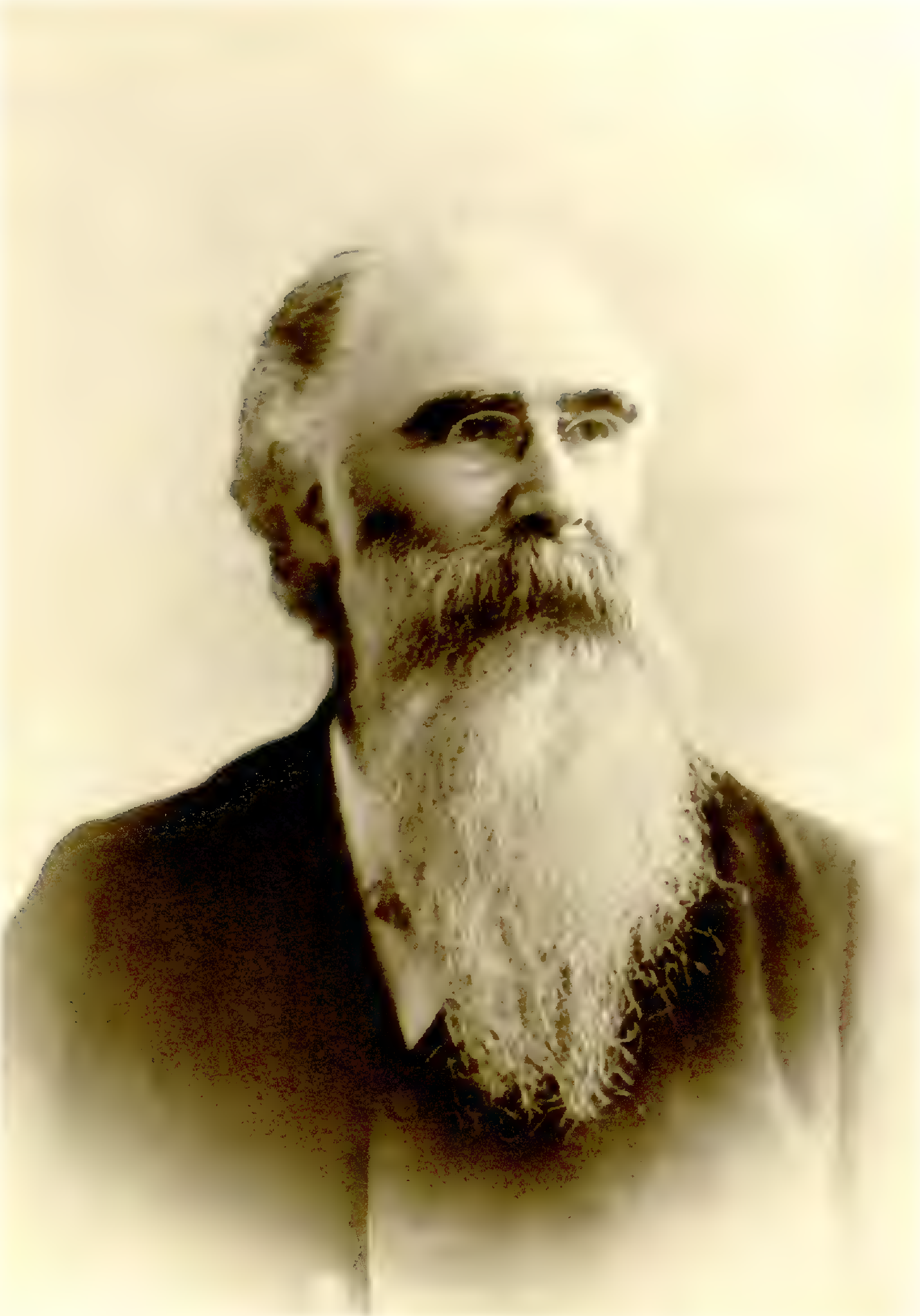
The Club meets regularly at Columbia College, 49th Street and Madison Avenue, New York City, on the second Tuesday and last Wednesday of each month, except June, July, August and September, at 8 o'clock, P. M. Botanists are cordially invited to attend.

MEMBERS OF THE CLUB will please remit their annual dues for 1895, now payable, to Mr. Henry Ogden, Treasurer, 11 Pine St., New York City.



J Bernard Brinton

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Biographical Sketch of Dr. J. Bernard Brinton.

[With Portrait].

The botanical community of Philadelphia has met with an almost irreparable loss in the very sudden death, on December 6, 1894, of the distinguished scientist, Dr. J. Bernard Brinton, the founder of the Philadelphia Botanical Club.

The many expressions of sympathy and high regard which have been received by his family from his fellow members of the Academy of Natural Sciences, the Torrey Botanical Club and numerous other scientists with whom he was engaged in active correspondence, prove conclusively that his premature death causes a vacancy which will be difficult to fill.

He was preëminent in more than one respect; most emphatically, however, in the happy faculty of imparting to others his own enthusiasm and love for the study of the Natural Sciences. He was noted for the accuracy of his observations in field excursions, in which he was generally recognized as the leader and guide.

His methods were always painstaking and careful, and in his aim to secure choice specimens no trouble, labor nor expense was too great. His botanical specimens were preserved by the most approved methods, mounted in the most artistic style and identified with the most scrupulous care. His mechanical ingenuity was frequently exercised in preparing specimens of fruits, stems and other organs, so as to advantageously exhibit their internal structure. In his desire for absolute accuracy he frequently sent difficult genera to monographers for scrutiny and revision.

This solicitude for accuracy made his herbarium exceedingly valuable for reference and comparison to his unmerous friends, who were in the habit of congregating in his botanical workroom. This place, built as an addition to his home, was familiary known as "The Den." Here he delighted in receiving his friends and exhibiting his scientific collections and numerous devices for facilitating botanical studies.

He was endowed with a marvellous memory for names and physical characteristics. This gift frequently enabled him to recognize specimens which he had not met with for many years. It was always a matter of gratification to him to surprise his scientific visitors with the demonstration of his mechanical skill as an amateur cabinet-maker. He personally constructed in the most skillful manner, his herbarium cases, tables, stands, microscopical cabinets, etc., with a degree of perfection rarely excelled by expert artisans. He also prepared, with that same mechanical skill, all his own collecting presses, which combined the several features of collecting portfolio and drying press. He was a microscopist of no ordinary ability, and took considerable interest in the application of this instrument in the investigation of vegetable histology. His collection of minerals in microscopic crystals has, perhaps, never been excelled in beauty and in the neatness displayed in their mounting. His dexterity in the dissection of botanical specimens was frequently envied by his less expert companions. While so ardently devoted to nature in her various manifestations, Dr. Brinton did not overlook the advantages of linguistic attainments. In his earlier life, much of his time was devoted to the study of German, in which language he conversed fluently. He was also proficient in Latin and French.

Physically, Dr. Brinton seemed to embody the highest expression of perfect manhood. His commanding presence and graceful bearing stamped him at once as a leader. His powerful frame enabled him to endure and overcome great hardship and fatigue.

Dr. J. Bernard Brinton was born near Waynesburg, Chester County, Penna., August 16, 1835. His parents belonged to the religious Society of Friends. His early education was received at this place and subsequently at the High School in Philadelphia, during the short residence of the family in that city, previous to removal to a farm in Maryland, in 1848. He began the study of medicine in 1857 and matriculated at the Jefferson Medical College, from which school he was graduated on March 25, 1859.

During his college course, the attention of Prof. Samuel D. Gross was attracted to him by the assiduity displayed in his studies, and furthermore by the successful management of an aneurism case treated by digital compression. As a result he was appointed Chief of the Surgical Clinic soon after graduation. He lectured on Practical Anatomy at the Philadelphia School of Anatomy and Operative Surgery, and also conducted a Quiz on Materia Medica. From his graduation to the breaking out of the Civil War he was an active practitioner of medicine, and in 1860 was a delegate to the American Medical Association, held in New Haven, Conn.

But the fire of patriotism proved too strong for the peaceful tenets of his fathers, and led him early in the war to apply for the position of assistant surgeon in the regular army. He successfully passed the rigorous examination, and his commission was dated April 16, 1862, signed by the President, Abraham Lincoln, and Edwin M. Stanton, Secretary of War.

On September 14, 1863, he was appointed Medical Purveyor to the Army of the Potomac, and he retained that position to the close of the war. During his entire army life he continued his botanical studies and collection of plants. At this time it was his good fortune to meet another officer equally interested in the study of the same science, Maj. Gen. G. K. Warren. A wayside flower served as a means of introducing these officers, and the occasion of that meeting was a favorite reminiscence of Dr. Brinton. The collections he made during the Virginia campaign were captured by the Confederate, Col. Mosby, at Belle Plain, May 12, 1864, and burned with the supply wagons. Dr. Brinton himself barely escaped capture. May 13, 1865, he was brevetted Captain and Major for gallant and meritorious services, and on November 16th, of the same year, he resigned from the army. His services to the Union were marked by his usual application and devotion to his sense of duty; and his report at the close of his term of office was considered a remarkably accurate record for one handling a vast amount of material under such turbulent conditions.

Returning to Philadelphia, he continued in the practice of medicine for a few years. Desiring more leisure time for the study of his chosen science, he abandoned medicine and engaged in various manufacturing pursuits. On October 29, 1878, he was elected a member of the Academy of Natural Sciences, and in the same year he connected himself with the Botanical Section of that institution. He was faithful in attendance and contributed numerous specimens, notes and verbal communications. He was an indefatigable collector and made numerous excursions in Pennsylvania and neighboring States. He made a special study of the peculiar flora of the Pine Barrens of New Jersey, in which department he was recognized as an authority. He acceptably filled numerous positions of honor and trust in the Academy of Natural Sciences, and at the time of his death was a member of the Board of Councillors. During the session of the American Association for the Advancement of Science, in Philadelphia, in 1884, he was elected a member, and he acted as guide to an excursion of visiting botanists to the pine barren region of New Jersey.

Only the ardent lovers of nature can understand his feelings on that occasion, when the main object was to show, Dr. Asa Gray and Mr. Caruthers, President of the Linnæan Society, the secluded *Schizæa pusilla* Pursh. Nor can the joy of those gentleman be expressed when their eyes rested on that quaint fern form for the first time.

He was elected to active membership in the Torry Botanical Club of New York, January, 1891. Although publishing but little on botanical subjects, he corresponded with most of the botanical authorities in America and made numerous exchanges. Perhaps his most important labor consisted in inducing the young to study botany, and his greatest pleasure seemed to be in imparting to others, either in the field or in his "den," a portion of his rich store of knowledge. Chiefly with this object in view, he founded the Philadelphia Botanical Club, in December, 1892, of which he was the President from its organization until the time of his decease.

The fundamental aim of the Club is to study the local flora and prepare an herbarium representing the plants found within a radius of fifty miles. Many of the members gratefully remember the aid they have received in the study of the science from Dr Brinton, whom they regard as their botanical preceptor. An intimate friend, Professor F. Lamson-Scribner, has forcibly expressed this sentiment in the following language:

"Those who have been with Dr. Brinton in his botanical excursions, as I have, will say with me, that in the field he was a keen observer and zealous collector, observing and collecting with an enthusiasm which was always contagious to his party."

"The results of these trips, which we enjoyed to the utmost, have enriched the herbaria of many scientific institutions and those of botanists in all parts of our country. His work and his conversation rarely failed to excite the ambition of others, and I am confident that many young men have received inspirations from their associations with Dr. Brinton, leading them to become better botanists or more earnest students."

Dr. Brinton was married on November 13, 1862, to Sallie W. Clemens, of Philadelphia. A married daughter and two sons survive him. As a source of consolation, after the death of his wife, he engaged more earnestly in botanical studies. It is a peculiar coincidence that he had expressed an intention of retiring from the Presidency of the Botanical Club, and at the time of his decease had in preparation a farewell address. His last evening was spent at the home of a lifelong friend, and the following verses were discussed, which now seem to have fittingly foreshadowed the final sleep that should soon come to one of the participants:

"Oever de stillen Straten,
Geit klar de Glockenslag,
God' Nacht! Din Hart will slapen;
Un' Morgen is ook een Dag.

Noch eenmal lat uns spräken;
Goden Abend, gode Nacht!
De Maand schient up de Däken
Uns Herrgott, hält de Wacht."

A. W. Miller, M. D.,
Geo. M. Beringer,
Jos. Crawford,
Committee.

Food Plants of the North American Indians.

By Dr. V. Havard, U. S. Army.

The maxim that "Necessity knows no law" is well exemplified in the diet of the North American Indians who, when driven by stress of hunger, eat whatever the animal and vegetable kingdoms bring within reach, so that it may be truly said of some tribes that they reject nothing which their teeth can chew or their stomachs digest, however tasteless, unclean and repulsive.

A review, therefore, of all the Indian food plants would include hundreds of species and be as tedious as unprofitable. I shall confine myself, in this paper, to the most important; those formerly, or yet, habitually used.

The subject naturally divides itself into two heads: 1st, plants cultivated; 2d, plants growing wild; and of the cultivated plants we may consider separately those introduced and those which are indigenous.

At the time of the discovery of America many tribes had already emerged from a wild nomadic life and, although still largely depending upon game and fish, were entering upon a partial sedentary agricultural state. So far as a chronic state of warfare would permit, land was set apart for farming purposes and upon it was almost invariably planted the triad of vegetables: maize, pumpkin or squash, and beans. This primitive agriculture was mostly pursued on and east of the Mississippi; in the arid interior comparatively small areas were occupied by agricultural tribes, and these dwelt chiefly in New Mexico and Arizona, and along the Missouri, Platte and Arkansas rivers.

The vegetables just mentioned were introduced from the south, being indigenous to Mexico or South America where a comparative state of civilization had fostered their evolution, and soon found their way to the St. Lawrence river and from the Atlantic to the Rio Colorado of the West. Cartier found them at Montreal in 1535, Champlain among the Five Nations in 1603, Hudson along the river bearing his name in 1609, the English at Jamestown in 1607, De Soto in the Gulf States in 1539, Marquette, Hennepin and La Salle in the Mississippi States, Cabeça de Vaca among the Pueblo Indians in 1528, and Alarçon on the Colorado in 1542.

The Pacific Coast tribes did not cultivate the soil and depended entirely on the spontaneous products of land and water. It is remarkable that these tribes, although having more or less intercourse with the Missouri Indians on the east and the Pueblo Indians on the south, and always on the verge of starvation, failed to introduce and cultivate the maize or other vegetables. Lewis and Clarke in their memorable expedition across the continent, from the Missouri to the mouth of the Columbia, in 1804 and 1805, found plenty of maize and beans at the Mandan villages, about 60 miles above the present town of Bismarck, N. D., but none north or west of that point.

Maize (*Zea Mays* L.) is probably indigenous to the southern highlands of Mexico. Under the civilization of the Mayas, Nahuas and Aztecs this precious plant received special care and many varieties were developed. Humboldt states that the Aztecs began to cultivate it in 666 A. D. It rapidly spread northward and, it is estimated, in the year 1000 had already reached the eastern States. At the time of the landing of Columbus it was the principal and most common crop of all agricultural Indians, as it soon became that of the white settlers. According to E. L. Sturtevant, one of our best authorities on the history of garden vegetables, the various agricultural species of maize: the flints, dents, softs, sweets and pops appear to be aboriginal forms, and we have no evidence that any new varieties have resulted from our three centuries or more of civilized cultivation. The very hardy form grown in Maine, and which must ripen its grain in three months from the day of planting, is certainly of Indian development, and so are the peculiar red and blue varieties cultivated in New Mexico as well as on the upper Missouri.

The common Kidney Bean (*Phaseolus vulgaris* Savi) is a South American plant; its culture under many varieties spread rapidly through Mexico and the States to Canada and was, next to Maize, the most important crop of farming Indians. The finding of seeds of this species by Professor Witmack in the prehistoric graves of Arizona, not only completed the demonstration of its American origin but likewise proved the antiquity of its culture in our own country. It is also probable that the Lima Bean (*P. lunatus* L.), which is of Brazilian origin, was used by our Southern Indians.

The third genus of introduced plants cultivated in pre-Columbian time is *Cucurbita*. The Common Pumpkin (*C. Pepo* L.) as well as the Squash (*C. maxima* Duch.) are natives of South or Central America and were grown coextensively with the preceding by North American Indians some of whose names, as applied to certain varieties, have endured to this day. The China or Barbary Squash (*C. moschata* Duch.) was also thought by Asa Gray to be of American origin and, if so, was doubtless known to our Southern Indians.

We come next to the consideration of native plants cultivated by the Indians. It may at once be stated that our gardens and orchards, unless we except the Jerusalem Artichoke and the Sunflower, do not contain a single plant developed by the Indians from any of our wild species. In exculpation we may say that, so far as fruits were concerned, an abundant supply could always be relied upon, while as regards roots, tubers or bulbs, it seems very doubtful whether there are more than two or three susceptible of marked improvement. It is only during the last 40 or 50 years that we have ourselves mostly evolved our many orchard forms of native fruits, while we have not yet produced a single vegetable. The Indians certainly exhibited commendable promptness and industry, after the advent of the whites, in introducing such fruits as were shown to be desirable. Thus the Peach brought into Mexico soon after the conquest was, according to the testimony of Du Pratz, found in general cultivation among the Indians of Louisiana when the French settled that province in 1698, and had become abundant in Georgia at the time of the settlement of the English in 1732. Wm. Bartram describes the carefully planted Orange groves of the Indians which he noticed in 1773. The early introduction and propagation of these two plants by the Indians led to the erroneous impression that they were of American origin.

Of the native plants cultivated by Indians we have no very clear or precise information, but I believe the following list includes most, if not all of them. The first place belongs to the Jerusalem Artichoke (*Helianthus tuberosus* L.). It produces many edible tubers, sometimes 2 inches in diameter, in our day mostly used for the feeding of cattle, horses and pigs, but which were precious to the Indians on account of their hardiness and prolificacy, retaining possession of the soil for many years. These tubers were mentioned by Champlain in 1603 and brought to France by Lescarbot who, in 1612, describes them as being "as big as small turnips, excellent to eat, with the taste of artichoke but more agreeable, and multiplying in a wonderful way." As the plant is native of the valleys of the Ohio and Mississippi and does not reach any part of Canada, it is evident that the Canadian and New England Indians who planted it must have obtained it from the tribes further south and west, so that we may infer a rather large area of cultivation. The Jerusalem Artichoke is, so far, the only contribution of North America, exclusive of Mexico, to the vegetable garden of the world, and it can be said to be an aboriginal contribution. Strange to note, it is now much more cultivated in the Old World than on this continent.

The allied species *H. doronicoides* Lam., found from Ohio to Missouri, and for a while erroneously thought to be the original of the Jerusalem Artichoke, has similar tubers although of coarser texture; it is quite probable it was also cultivated. The "Indian Potato" of the Assiniboine tribe, mentioned by Bourgeau, is the tuber of a form of *H. giganteus* L., which ranges from Minnesota to the Saskatchawan river.

Apios Apios (L.) MacM. (*A. tuberosa* Mœnch), the Ground-Nut, has edible round or pyriform tubers strung upon long subterranean shoots, varying in size from a nut to a hen's egg; they contain a large proportion of starch and have, when cooked, somewhat the taste of potatoes, being wholesome and nutritious. Rafinesque tells us that this plant was formerly cultivated by the Indians, and still by the Creeks at the time of his writing, not only for the tubers but also for the seeds which, he thinks, are as good as peas. It must have been extensively used by the eastern and southern Indians as all early explorers mention it and some were saved by it from starvation. The tubers were the "Penacs" of the Canadians, the "Hopnis" of the eastern tribes, and apparently the "Openauk" of Hariot, seen in Virginia in 1584 and described as "a kind of round root, some as big as walnuts, some far greater, found in moist and marshy grounds, growing many together in ropes as though they were fastened with a string." Asa Gray said that had civilization started in America instead of Asia, "our Ground-Nut would have been the first developed esculent tuber and would probably have held its place in the first rank along with potatoes and sweet potatoes of later acquisition." In this connection it should be said that native cultivation does not appear to have had any effect upon the size and quality of this tuber, and that experiments by Vilmorin and others with a view to its improvement have not been successful, although hardly continued long enough to be conclusive. The tuber is of slow growth, requiring two or three years before reaching sufficient size to be useful, and its creeping, scattering habit renders the harvest laborious.

Nelumbo lutea Pers., the Yellow Nelumbo or Water Chiquapin, is the finest of our water-lilies, occurring from the Great Lakes to the Gulf, and westward to Minnesota and Nebraska. In the northern Atlantic States it has only been found in the Delaware river below Philadelphia, in Swartswood Lake, N. J., and in the Connecticut valley, so far out of its range as to lead to the general supposition that the Indians brought and naturalized it in these local habitats. Although difficult of propagation the plant was certainly worthy of the effort. The spindle-shaped, often angled and furrowed tubers are 5 to 10 inches long and weigh from 2 to 8 ounces; when baked they have, says Dr. G. Engelmann, a pleasant, sweet and mealy taste much resembling that of the sweet potato, without anything reminding one of their growth in stagnant water. The boiled or baked seeds have the taste of chestnut and are highly nutritious, while the petioles and young leaves may be eaten as spinage.

Orontium aquaticum L., or Golden Club, the "Tawkee" or "Tawkin" of the Indians, is also an aquatic perennial with deep, bulbous rootstock and large pea-like seeds. Both roots and seeds were much prized by the Indians and, according to Peter Kalm, by some of the white colonists as well; the seeds specially being, after sufficient cooking, quite palatable. This plant grows in ponds along the coast from Massachusetts to Florida. It has also been found in isolated places further inland, near the site of Indian villages, where it is supposed to have been propagated by the natives; but this is a mere hypothesis.

The following native plants were cultivated for their fruit.

The Common Sunflower (*H. annuus* L.) is an American plant which, under several forms, extends from the arctic circle to the tropics and from the Missouri river to the Pacific. It was commonly cultivated by the Indians, from Canada to Mexico, west and east of the Mississippi, being for many of them a staple article of food. The seeds were parched, ground and made into a palatable and nutritious bread said by Palmer and Douglas to be hardly inferior to corn bread. By expression they yield about 20 per cent. of an excellent table oil which the Indians, more mindful of their appearance than of their diet, mostly used for anointing their hair and skin. The culture of this plant in Canada was noticed by Champlain and, a few years after, by Sagard; in that region the seeds must have been obtained from beyond the Mississippi and a little south, through the agency of intervening tribes. As in the case of *H. tuberosus* it is interesting to note that this native plant is much more extensively cultivated in the Old World than in the New.

Prunus Americana Marsh, and *P. nigra* Ait., our two species of Wild Yellow or Red Plum, were, according to several authorities, planted by the New England and Canadian natives, and from the many forms discovered farther west it is not improbable that this culture extended to the Mississippi. Some forty-five horticultural kinds derived from them are described by Prof. Bailey, and it is not assuming too much to suppose that several of them are due to variations initiated by Indian industry. It is probable enough, however, that the native orchard was seldom regularly planted, but oftener the accidental result of seeds dropped in the vicinity of camping grounds and villages.

Prunus angustifolia Marsh, the Chickasaw Plum of the South, is regarded by Prof. Sargent as native of the eastern slopes of the southern Rocky Mountains and of the plateaus extending thence to the Mississippi, and as having been introduced by the Indians into the southern Atlantic States where it soon became extensively naturalized. Clumps of it were found about all Indian villages, and the variations thus started have doubtless developed into some of our seventeen horticultural forms.

Of the cultivation of *Prunus hortulana* Bailey, the common native species of the middle Mississippi region, we have no direct evidence; but as Plums were planted north and south of that region it is quite probable that the differentiation which has resulted in giving us some twenty-six horticultural forms is also of Indian origin.

At least one species of grape was cultivated for its fruit. *Vitis Arizonica* Eng. has been found growing in rows near Fort Whipple, Ariz., which may be accepted as conclusive evidence of its culture by the Pueblo Indians. It was unfortunate that the Grape thus selected should be described by Munson, the eminent viticulturist, as the least promising of all the species for improvement in fruit. Considering the ease with which Grapes are propagated, by seeds, cuttings or layers, it is likely enough that other species were grown, specially *V. Labrusca*, our northern Fox-Grape, although there appears to be no proof of it.

It seems quite probable that the Pecan and one or more Hickories were more or less planted, as the abundance of nuts is often alluded to by the first explorers. Wm. Bartram, in the account of his travels through the South in 1773, mentions an Indian plantation of Shellbark Hickory. There is likewise some ground for the belief that our native Red Mulberry was cultivated, the fine quality and great quantity of the fruit being mentioned by De Soto and others.

The last of this group of food plants, so far as I know, is *Passiflora incarnata* L., the Maypop of the Southern States, which was cultivated by the Indians of Virginia. Says Captain John Smith: "They plant also maracocks, a wild fruit like a lemon, which increases infinitely"; elsewhere he refers to it as "pleasant" and "wholesome." The fact is that it contains but little nutriment and does not appear susceptible of improvement. The plant itself, on account of its spreading perennial and deep roots, is a noxious weed.

For the sake of completing the list of plants cultivated by aborigines I may be allowed to mention one or two which, although not food plants, were propagated with full as much industry and success as the Maize or the Sunflower; I mean species of Tobacco (*Nicotiana*). The Common Tobacco (*N. Tabacum* L.), of South America, was not known to our Indians except perhaps as var.

undulata Sendtner, the Yaqui Tobacco grown by some of the natives of Arizona and California. The Tobacco cultivated by our Southern and Eastern Indians was the Mexican species *N. rustica* L. now naturalized and occasionally found as a weed, while on the Missouri and farther west the native *N. quadrivalvis* Pursh was mostly used. The var. *multivalvis* Gray of the latter, a form derived from cultivation, or perhaps a distinct species, has been used by the Pacific Indians from time immemorial and is said, by Douglas, to be the only vegetable which the natives of the Columbia cultivated.

I shall now proceed to enumerate the native plants which in their wild or uncultivated state furnish food to the Indians.

Roots, Tubers and Bulbs.

Sagittaria latifolia Willd. (*S. variabilis* Eng.), the Common Arrow-head, is an extremely variable species, extending from the Atlantic to the Pacific and from British America to Mexico. It has tuberous oblong roots the size of a hen's egg, but sometimes as large as a man's fist, which either boiled or roasted were much consumed by the natives all over the land. It was the "Katnis" of the eastern tribes, the "Wabesipinig" or Swan Potato of the Chippeways in Minnesota, and the "Wappatoo" of the Columbia river Indians. It appears to have been, next to Camas, the most useful root of the Pacific slope natives; its name recurs almost on every page of certain chapters of Lewis and Clarke's narrative from which I quote the following: "The most important spot is Wappatoo Island, a large tract lying between the Multnomah and an arm of the Columbia. The chief wealth of this island is found in the numerous ponds of the interior which abound with the common Arrow-head. The bulb, to which the Indians give the name of Wappatoo, is their great article of food and almost the staple article of commerce on the Columbia. It is never out of season, so that at all times of the year the valley is frequented by the neighboring Indians who come to gather it. It is collected by the women; each takes a light canoe into a pond where the water is as high as the breast, and by means of her toes separates from the root the bulb which, on being freed from the mud, rises immediately to the surface of the water and is thrown into the canoe. In this manner these patient females will remain in the water for several hours, even in the depth of winter."

A form with very large smooth leaves, about as wide as long, from Central to Southern California, thought by Parish to be the introduced *S. Sinensis* Sims, is cultivated by the Chinese in California for its tubers.

We next come to the roots furnished by the Arum Family (ARACEAE). All the plants of this order are impregnated with an intensely acrid and pungent principle. The pangs of hunger must indeed have been keen which drove the natives to experiment with them, but the happy discovery was made that drying and cooking dissipated this noxious acridity and that the roots contained a large proportion of nutritious starchy food. *Arisaema triphyllum* (L.) Torr., the Indian Turnip of our woods, has a bulbous rounded or flattened root, 1 to 2 inches in diameter, which, according to G. H. Harris, is the "Hopnis" of the Seneca Indians and once their habitual bread-root. *Peltandra Virginica* (L.) Kunth, the Arrow Arum, has a short, very thick, deep-seated rootstock, sometimes 6 inches in diameter and weighing 5 or 6 lbs., the "Tawho," "Tuckah" or "Tuckaho" of the natives, and, according to Capt. J. Smith, the root chiefly used for food by the Virginia Indians. "In one day," says Peter Kalm, "a savage will gather enough for a week . . Unless carefully roasted it will prickle the throat extremely, but he so manages it in case of necessity as to make bread of it." He adds that hogs are very greedy of the roots and grow fat upon them. Bartram told him that the savages also boiled the spadix with the berries and devoured them as a great dainty. According to Rafinesque the seeds may be used as a substitute for pepper. The other species, *P. sagittaefolia* (Michx.) Morong, has somewhat similar roots.

The roots of *Calla palustris* or Water Arum, *Orontium aquaticum* or Golden Club, and even of *Spathyema foetida* (L.) Raf., our Polecat Weed, were also used but to a lesser extent. *Colocasia antiquorum* Schott and *C. esculenta* Schott were introduced into the Southern States at a very early date, but probably not before the advent of the whites.

I may mention here, not as a root, but as a root growth, the true "Tuckahoe" or "Indian Bread" of the Southern States, a fungus, *Pachyma cocos* Fries (*Lycoperdon solidum*), springing from the roots of trees in sandy soil, of about the size of a man's head, with scaly woody bark and white, homogeneous granular interior. It is, like other fungi, destitute of starch but contains about 80 per cent. of carbo-hydrates almost entirely in the shape of insipid pectin whose nutritive value is still undecided but probably not great.

On the low grounds of Southern Florida grows a beautiful plant of the CYCADACAE, *Zamia integrifolia* Willd., the "Coontie" of the Indians, which contains in the caudex and roots about 65 per cent. of an excellent starch sometimes called Florida arrow-root. This plant supplied the Seminoles with food during their long wars with the United States and is now more or less cultivated.

Certain species of *Claytonia,* which we cultivate in our gardens for their delicate beauty, grow from deep edible bulbs whose crisp flesh and nutty flavor were much prized by the natives. I may mention *C. Virginica* and *C. Caroliniana* of the eastern States and *C. Caroliniana sessilifolia* Torr. of the Rocky Mountains and westward. *C. megarrhiza* Parry has a large fleshy tap-root, but it is confined to the summits of the Rocky Mountains and seldom available. *C. perfoliata* Don, of the Pacific States, where it is known as "Spanish Lettuce," is eaten as salad and cooked as greens.

Another elegant little plant of the same Purslane Family is *Talinum aurantiacum* Eng., found everywhere in Texas west of the Pecos river and whose tuberous root is quite edible when cooked.

If we now leave the eastern States and extend our investigation westward, beyond the Mississippi, the first plant deserving of attention is *Psoralea esculenta* Pursh, the "Pomme de Prairie" or "Pomme Blanche" of the Canadian explorers and voyageurs, the "Prairie Turnip" or "Prairie Potato" of the Americans, the "Tipsinah" of the Sioux and the "Tahgu" of the Osage Indians. It is widely distributed, being most abundant on the dry tablelands of the Missouri region, from Montana through Dakota and Nebraska to Kansas. The tuber is irregularly elliptical or conical in shape, ranging in size from a large filbert to a hen's egg, averaging 1½ to 2 inches in length. On section it is seen to be composed of a white granular substance easily pulverized into a light starchy flour. Raw it has a very palatable farinaceous flavor entirely devoid of bitterness; cut into slices and dried it is easily kept and may be found to this day in all the tents of the Sioux Indians for whom it has always been a staple food. They generally eat it cooked, and as they appreciate the advantages of a mixed *pot-au-feu*, boil it with tripe, fattened pup or venison. According to an analysis by Mr. Clifford Richardson (from material I sent him) the tuber contains 70 per cent. of starch, about 5 of a sugar new to chemistry, and 9 of nitrogenous matter under several forms. No serious and prolonged attempt has as yet been made to develop this tuber by cultivation and selection; such attempt is certainly desirable and, if successful, would give us a toothsome, wholesome and nutritious vegetable, remarkable for its large proportion of starch and nitrogen, and peculiarly adapted to our arid regions.

Five other species have, likewise, tuberous edible roots: *P. hypogaea* Nutt., a smaller plant than the preceding, with a somewhat more southern range and probably often confounded and collected with it by the Indians; *P. Californica* Wats. (*P. mephitica* Wats.) and the allied, if distinct, *P. castorea* Wats., ranging from Colorado to California, and affording food to the Pah-Utes; *P. canescens* Michx. of the Southern States, remarkable for its very long subterranean stem ending with a large conical tuber, evidently too deeply buried to have been noticed by the natives; *P. subacaulis* T. & G., a rare and local Tennessee species.

Another member of the Leguminous family is our Wild Liquorice (*Glycyrrhiza lepidota* Nutt.), mostly noteworthy as a very bad weed in the west, everywhere too prevalent. The long slender rhizome has a faint sweetish taste of liquorice, and the Indians sometimes chew it for its supposed tonic and expectorant effects. Much more valuable to the natives is the Chenook Liquorice, a Lupine (*Lupinus littoralis* Dougl.), of the coast of Oregon and Washington, with long tapering granular roots which, when roasted, yield a pleasant farinaceous food.

Our native Umbellifers yield a certain number of useful edible roots. To my taste and within my experience, the most delicately flavored (in the raw state) is that of *Carum Gairdneri* B. & H., the

"Yamp" or "Yampah" of the west, extending from the Rocky Mountains to California and British Columbia, being particularly abundant on the Little Snake, or Yampah, river. The fusiform or conical roots are in close clusters of 2–5, about an inch long and a half-inch thick, consisting, within the blackish skin, of a pure white, farinaceous substance. They have a delicious sweet nutty aromatic flavor, without any bitterness or astringency. Raw or cooked, they have always been highly valued by Indians, specially the Shoshones and tribes of the Snake river and tributaries, as well as by all explorers and settlers. Bears and pigs are very fond of them, often tearing up large tracts of ground in their search. Chemically, they are remarkable for the large proportion of sugar and albuminoid matter they contain. There is little doubt that if susceptible of enlargement by culture, the Yamp would soon become a favorite in the vegetable garden.

Two other species, *C. Kelloggii* Gray, the "Wild Anise" of Central California, and *C. Oregonum* Wats., have similar roots.

Probably still more important to the Indians, among the Umbellifers, on account of its wide distribution and abundance, is the genus *Peucedanum* of which we have some 46 rather closely related species. Ten, ranging from the Rocky Mountains to the northern Pacific Coast, have tuberous edible roots more or less used by the natives. The tubers are seldom over an inch in diameter and almost entirely made up of an homogeneous white starchy substance, palatable when raw, with a faint celery-like flavor, but generally roasted or baked and pounded into flour from which nutritious and wholesome bread or cake is made. The best tuber is probably that of *P. Canbyi* C. & R., the "Chuklusa" of the Spokane Indians. It contains, according to an analysis by Prof. H. Trimble, 17 per cent. of starch, 11 of saccharose, 3 or 4 of albuminoids and 15 or 16 of mucilage. The tuber of *P. eurycarpum* C. & R., the "Skelaps" of the Spokane Indians, has also been examined by Prof. Trimble, who found 35 per cent. of starch, about 10 of albuminoids, only 2 of saccharose and 3 or 4 of mucilage, a composition surprisingly different from that of the preceding. The bulb of *P. farinosum* Geyer, the "Tuhwha" of the Spokanes, is equally good; to it, as well as to other species, the name "Biscuit-root" has been given by the whites.

Other tuberous species worthy of mention are *P. Geyeri* Wats., *P. ambiguum* T. & G., and *P. Cous* Wats., the Indian designation "Kous" applying likewise to other species.

The allied genus *Cymopterus* contains also species with thick elongated or tuberous, more or less edible roots, much prized by the Indians of the Rocky Mountain region and the Great Basin. The best known, as esculents, are *C. globosus* Wats., *C. glomeratus* Raf., *C. montanus* T. & G. The latter has a fusiform parsnip-like root the size of a man's finger, of a very agreeable taste, and a good vegetable in early spring when soft and tender. *C. Fendleri* Gray, the "Chimaja" of the Mexicans, is impregnated with a pleasant anisate volatile oil, and used to flavor meats and make bitters in New Mexico. *C. purpureus* Wats. is used as a pot-herb to season soup and mush by Navajo Indians.

The immense family of the Compositae presents very few plants for our consideration; the most noteworthy belong to the genus *Cnicus* or Thistle. Lewis and Clarke describe a Thistle on the Lower Columbia called "Shanataque" by the natives, with fusiform root a foot long and about the size of a man's thumb which when baked becomes very palatable and "the sweetest vegetable eaten by the Indians." Mr. Thomas Howell thinks the plant must be *Cnicus edulis* Gray, although the specific name of the latter refers only to the esculent qualities of the young stems which are fleshy and tender; the value of the root appears to have been overlooked. Fremont speaks of another Thistle, not determined, found on the middle and lower part of Bear river (in Idaho and Utah), with root the size of a carrot and very agreeably flavored. I may also mention *C. Drummondi* Gray, whose edible roots are stated to have saved from starvation a lost explorer of the Yellowstone Park in 1870.

The genus *Balsamorrhiza* Hook., of the Rocky Mountains and the Pacific States is characterized by thick and deep roots which exude a terebinthine balsam. They are edible, raw or cooked, after peeling off the thick bark which contains most of the balsamic oleo-resin. Not only the roots but also the young stalks and the seeds were used for food by the Indians.

The same remarks apply to the allied genus *Wyethia* Nutt., which has likewise fleshy roots and large albuminous seeds.

The last edible Composite to be mentioned is *Microseris nutans* Gray, with succulent almost transparent roots full of a bitterish milky juice, which are eaten raw by the Nez Percés Indians.

The PORTULACACEAE contain one species noted from the earliest days as an important Indian food plant, *Lewisia rediviva* Pursh, the "Spatlum" and "Chitah" of the natives, the "Bitter-root" of the whites, ranging from the Rocky Mountains to the Pacific, and giving its name to the Bitter-root mountains of Montana. It is a handsome little plant and very remarkable for its wonderful vitality, having been revived and successfully planted after being kept months in herbarium. The roots, 3 or 4 or more, are curled and twisted and seldom thicker than a goose quill; their brownish-red bark is intensely bitter while the inner white and farinaceous part is quite palatable and nutritious, although having in the raw state a slight bitterish flavor. Boiled or otherwise cooked they are excellent food, extensively used by the Indians. An analysis by Prof. Trimble yielded about 15 per cent. of gum and mucilage, 3 or 4 of albuminoids and 8 or 9 of starch; no evidence of sugar could be obtained. The statement once made by a too credulous observer, and since often repeated by authors that this root "abounds in concentrated nutriment," is certainly very much exaggerated. The other species, *L. brachycalyx* Eng. has similar roots.

In the MALVACEAE we find but one genus with fleshy edible roots, *Callirrhoë* Nutt. One of the handsomest species, *C. digitata* Nutt. of the southern plains, has a fusiform root, in shape and size between a small turnip and a parsnip, said to be even more pleasant tasted than that of *Psoralea* and highly prized by the natives. *C. pedata* Gray, of the Texas prairies, and other species have similar farinaceous roots.

The showy genus *Amoreuxia*, of the BIXINEAE, is represented in our country by *A. Wrightii* Gray, of southwest Texas and *A. palmatifida* DC. (*A. Schiedeana* Planch.) of Arizona and Mexico. The roots of the former are greedily devoured by peccaries and other animals; those of the latter when roasted have the taste of the parsnip and carrot, and are eaten by the Papago and Pimo Indians as well as by the Mexicans under the name of "Sayas."

Turning to the mountains of New Mexico, Arizona and Texas, we find two Potatoes, *Solanum tuberosum boreale* Gray and *S. Jamesii* Torr., whose tubers have always been among the chief articles of food of the Navajo Indians. The var. *boreale* is so far removed and cut off from its Andean type, by the absence of intermediate Mexican and Central American forms, as to make their close relationship a very interesting fact in geographic botany. Its tubers differ only from those of the Common Potato by their smaller size, being from half to three-quarters of an inch in diameter, and by a peculiar aroma. The tubers of *S. Jamesii* are still smaller, dark-colored and usually covered with minute tubercles. These plants are hardy and of easy growth, readily responding to cultivation, so that it seems strange that the Navajo or Pueblo Indians should not have planted and developed them. The tubers of var. *boreale* are readily improved in size, as shown by Prof. Bailey who has obtained some 4 inches long still retaining their distinguishing aroma. This variety of the Common Potato is beyond a doubt the most promising native food plant of North America outside of Mexico, and was the one most worthy of the attention of the aborigines.

In about the same region and extending north into British America is found the "Kooyah" or "Tobacco-root" of the French (*Valeriana edulis* Nutt.), with large fusiform perpendicular rootstock dividing below into deep and thick branches. This root, black outside and bright yellow inside, is remarkable when fresh for its very repulsive odor and taste, resembling those of chewing tobacco, but when thoroughly cooked is sweet, palatable and nutritious. This plant is of great importance to the Indians of the Great Basin and the Northwest. Fremont, on reaching Bear river, in northern Utah, wrote: "I ate here for the first time the Kooyah, the principal edible root among the Indians who inhabit the upper waters of the streams on the western side of the Rocky Mountains." I doubt whether this plant is worth cultivating for its root, but its medicinal properties might be profitably investigated.

The Lily Family (LILIACEAE) contributes quite generously to the vegetable diet of the Indians, as I shall now proceed to show.

Taking everything into account, abundance, size, taste and nutritiousness, the best of all native bulbs is doubtless that of the

Camas or Quamash (*Camassia esculenta* Lindl.), a showy plant ranging from the Rocky Mountains to California and British Columbia, sometimes so abundant on rich meadows as to tint them a uniform light blue color, suggesting, as expressed by an early explorer, "a lake of clear water." The bulb is globular-ovoid, resembling a small onion; raw it has a mucilaginous, rather insipid taste, but baked it acquires the flavor as well as the color of chestnut. Lewis and Clarke were probably the first white men to eat it, as told in their narrative: "The Indians set before us a small piece of buffalo-meat, some dried salmon, berries and several kinds of roots. Among these last is one which is round and much like an onion in appearance and sweet to the taste; it is called Quamash and is eaten either in its natural state or boiled into a kind of soup or made into a cake called "pasheco." After our long abstinence this was a sumptuous treat."

Camas has always been one of the chief articles of subsistence of all Indians in and west of the Rocky Mountains. They usually bake it in heated pits, sometimes mixed with a black hair-like lichen (*Alectoria jubata*) which grows in profusion on *Larix occidentalis*, the result being a dark brown homogeneous soft mass which is fashioned into large cakes.

The other four species of *Camassia* described, all closely inter-related, have the same kind of edible bulb, with the exception of *C. Cusickii* Wats., the largest and finest, whose bulb is said, perhaps without sufficient investigation, to be nauseous and very acrid.

The bulbs of all the species of *Allium*, or Garlic, are more or less edible and nutritious in spite of the strong-scented volatile oil they contain; many references are made to the "Wild Leekes" and "Wild Onions" by the first explorers who were sometimes compelled to follow the example of the Indians and eat them to sustain life; however, it was their abundance all over the land which gave them value rather than their quality.

Several species of *Smilax* have thick knobby tuberous rootstocks, which were utilized by our southern Indians. The most noted is *S. Pseudo-China* L., with extensively spreading and fascicled roots containing a large proportion of starch readily obtained as a reddish sediment by washing in water, and formerly, according to Bartram, made into soup, bread or jelly. Later these roots were used by the white settlers, mixed with molasses and parched corn or rice, to make a very wholesome and palatable beer. The rootstocks of *S. Bona-nox* L., *S. glauca* Walt., *S. rotundifolia* L. and *S. Beyrichii* Kunth (*S. auriculata* Chap.) were indiscriminately collected and used with those of the last.

Another eastern plant of this family, but of little consequence, is the Indian Cucumber-root (*Medeola Virginiana* L.) with horizontal yellowish rhizome, 1 to 2 inches long, having a sweetish cucumber-like taste and more medicinal than nutritious.

The Star Tulips and Mariposa Lilies of the genus *Calochortus* so abundant and conspicuous in the Pacific States, have nearly all edible farinaceous bulbs. The best known, as food plant, is *C. Nuttallii* T. & G. which extends eastward to the Rocky Mountains and even the prairie region beyond; it is the "Sego" of the Indians and Mormons; the bulb is about the size of a walnut, very palatable and nutritious, and is still used not only by Indians but by hunters and miners as well.

Brodiæa Smith, a California genus, has likewise edible bulbs; those of *B. congesta* Smith and *B. capitata* Benth., although small, are agreeably sweet and mucilaginous.

Hesperocallis uudulata Gray, the Desert Day Lily, grows in the Colorado and Mohave deserts; it has a deep-buried ovate-globose bulb 1 to 4 inches in diameter, with firm palatable and refreshing flesh, quite welcome to Indians and explorers in the absence of other vegetables.

Chlorogalum pomeridianum Kunth., of California, is better known as a soap and a fiber plant than as a food plant, but it is also sometimes called, and for good reason, "Wild Potato." The egg-shaped bulb is 1 to 3 inches in diameter and about 4 long, thickly covered with coarse brownish fibres resembling the coir of the cocoa-nut. A chemical investigation by Prof. Trimble showed 1.87 per cent. of saponin (or 6.95 in the absolutely dry bulb), as well as glucose, saccharose and mucilage. The large proportion of saponin accounts for the use of the bulb as a valued substitute for soap. Cooking eliminates all acrid and injurious substances, rendering the bulb good, wholesome food with much the taste of camas.

In the Sedge Family (CYPERACEAE), we only find 2 or 3 food plants of minor interest. The Great Bullrush (*Scirpus lacustris* L.) is a widely distributed plant, ranging from the Atlantic to the Pacific and from British America to the tropics. The stalks and leaves are commonly used by many tribes for mats and baskets; the pollen, beaten off and collected on a cloth, is sometimes made into cake. The thick fleshy rootstock of var. *occidentalis* Wats., the "Tule" of the Pacific States, is baked and eaten by hungry Indians. Gen. J. Bidwell describes a honey produced abundantly on a form of "tule" in Nevada, and eagerly gathered by the natives.

Two species of *Cyperus*, the Chufa (*C. esculentus* L.) and the Nut-Grass (*C. rotundus* L.) are extremely noxious weeds in the eastern and southern States on account of their rapid propagation by tuberiferous stolons and difficult extirpation. The Indians, however, looked upon them with favor because of the small edible tubers, specially those of Chufa, which are sweet and palatable, and even now occasionally planted as food for swine.

Finally, it remains to mention one Fern, the Common Brake or Bracken (*Pteris aquilina* L.), the most widely distributed of the order. The blackish rootstocks are eaten in parts of Europe and by some of our Pacific Indians. "They have a pungency," say Lewis and Clarke, "which was disagreeable to us, though the natives eat them voraciously, and they seem to be very nutritious."

FRUITS.

The Indians eat not only all the native fruits which we eat and have more or less improved, but also many others for which we have never cultivated a taste. It is only of these specially aboriginal fruits that I shall speak.

In the Cactus Family the genus *Opuntia*, economically speaking, is probably the most important. Even the fruit of our little Prickly Pear (*O. vulgaris* Haw.) is not entirely worthless, but it is in the arid regions of the Southwest that we find a majority of our 50 native species in their best development. The fruit has a peculiar and mucilaginous taste, sometimes pleasantly acid, but often insipid and mawkish. It contains little nutriment, but quenches thirst in the desert. *O. Engelmanni* Salm, ranging from the mouth of the Rio Grande to the Pacific, is the most noteworthy; not only do Mexicans and Indians eat its fruit with avidity, but the leaves as well when necessity requires. The leaves, or rather joints, of this and allied species are very juicy and an important fodder for cattle and sheep, being at once food and drink.

The Mexican Prickly Pear or Tuna (*O. Tuna* Mill.), cultivated in Mexico from time immemorial, and whose fruit is found in all the markets of that country, was not known to our Indians; it was brought by the Spaniards into Florida and California where it is now naturalized.

The seeds, not only of the fruit of *Opuntia* but of all edible species of the order, are often separated by the Indians, parched and pulverized and made into excellent gruel.

Most remarkable is the Giant Cactus (*Cereus giganteus* Eng.) the Suhuara or Pitahaya of the Mexicans and the vegetable wonder of Arizona, a tree mostly without branches, the straight, grooved shaft 30 to 50 feet high. The fruit is 2 to 3 inches long, full of a rich crimson pulp of a fine flavor and a great dainty to the Apaches, Pimos and Papagos. From it they prepare a clear light-brown syrup used as a substitue for sugar, and a fermented liquor having the taste and smell of sour beer.

Still larger, sweeter and finer is the fruit of *C. Thurberi* Eng., the Pitahaya Dulce, common in Sonora and Lower California but not yet observed in the United States. Half a dozen other arborescent species of *Cereus* with edible fruit have been described from Northern Mexico and Lower California. Of the low and cespitose species, by far the most interesting from our standpoint is the Straw Cactus (*C. stramineus* Eng.) of Western Texas. The ripe fruit is red, 1½ inches long and 1 thick, with thin skin bearing but few spines and easily peeled off; the seeds are so fine as to be unnoticed; it is equal or superior, in quality and flavor, to the best strawberry.

The genus *Mammillaria* or, as revised by Prof. Coulter, *Cactus*, contains many native species bearing red berries of excellent taste; I have eaten these with great relish on the Upper Missouri from *C. viviparus* and in Western Texas from *C. Heyderi* and others, while in Southern California *C. Goodrichii* is said by Orcutt to yield a delicious strawberry-like fruit.

I may close my remarks upon this order by a mention of the

Peyote (*Anhalonium fissuratum* Eng.) of the rocky highlands of Western Texas and Northern Mexico, a plant which, when chewed, is said to produce a sort of delirious intoxication and on that account sometimes called "Dry Whisky." Another species (*A. Lewini*) of the Lower Rio Grande and Mexico possesses the same remarkable properties. Both are well worthy of investigation.

The seeds or "nuts" of many species of Pine are large and albuminous, forming, in several parts of the country, not only an important but almost an indispensable source of subsistence to the Indians. They are oily and often have a strong terebinthine or bitter taste when raw, but after being roasted they are not only nutritious but also pleasantly flavored.

Our best known Nut Pines are the Single-leaved Pine (*Pinus monophylla* Torr.), so precious to the Indians of the Great Basin, and the Two-leaved Pine or Piñon (*P. edulis* Eng.), perhaps only a variety of the preceding, ranging from Colorado to Texas and Arizona. The wingless seeds are elliptical or globose in outline and half an inch in length. Speaking of their value to the Indians Dr. Newberry says: "They are treasured as their choicest delicacies, and a handful of pine-nuts is to an Indian child as much of a treat as are sugar-plums to our boys and girls. Some of the Piñon groves on the flanks of the Sierra de la Plata, in Southwestern Colorado, have evidently been visited periodically by the Pueblo Indians for ages, for fragments of their peculiar ornamented pottery cover the ground."

The Mexican Nut Pine (*P. cembroides* Zucc.), with leaves mostly in threes but with the same seeds, extends north into Arizona and Lower California. Also belonging to this group is *P. Parryana* Eng., of Southern California and Lower California, with leaves mostly in fours.

The Sugar Pine (*P. Lambertiana* Dougl.) of the Pacific slope, the most gigantic species of the genus, with cone sometimes a foot and a half long, has edible seeds a half-inch long. The Gray-leaf or Digger Pine of California (*P. Sabiniana* Dougl.) has a shorter, thick, massive cone with black seeds, the largest in the genus, nearly an inch long; these are collected in immense quantities by the Digger Indians for winter use, being not only a nutritious food but very digestible and specially suitable for delicate stomachs. Nearly related to the preceding is *P. Coulteri* of the coast ranges south of San Francisco, with stout, long, strongly incurved cone-spines, and somewhat smaller but equally palatable seeds.

Another genus of Conifers, *Juniperus*, contains three species whose fruit deserves mention: *J. occidentalis* Hook., with its several varieties, extending from Texas to the Northern Pacific coast; *J. Californica* Carr. of Southern California, with a variety extending to Utah and Nevada; *J. pachyphloea* Torr. of Western Texas, New Mexico and Arizona, apparently merging into *J. Mexicana* Schl. of Northern Mexico. They all bear abundant globose greenish or copper-colored berries with a mealy, resinous and not very unpalatable taste. Those of the last-named species are the largest (often half inch in diameter) and best; I have eaten them, not greedily, but without repugnance. Mexicans and Indians consume large quantities of these berries and make them into a bread which, Dr. Palmer says, is of "chaffy and saw-dust consistency." According to the same authority this bread contains the following constituents which would indicate unexpected nutritiousness: Water 14.34, protein compounds 5.69, starch 17.87, sugar 10.66.

Another fruit of much importance to the Indians is that from many of our Oaks. Acorns contain starch, fixed oil, citric acid and sugar, as well as astringent and bitter principles. They are sometimes sweet enough to be eaten raw without preparation, but it is generally necessary to rid them of their bitter principle; this is done by shelling and skinning, then pounding them into meal and washing thoroughly in water; the meal is then ready for boiling into mush or baking into cake or bread. Not long ago I received specimens of *Quercus Garryana* from Fort Gaston, in Northern California, with the information that the acorns were still a common article of food among the Hoopah and other Indians of that reservation. To remove the bitterness they place the meal in a hole dug in wet sand, so that in gathering it up more or less sand is unavoidably mixed with it, enough to have a decided effect upon the teeth. My informant, a medical officer, tells me that he has seen an Indian 45 years old with the crowns of his otherwise healthy teeth half gone, while, in Indians 60 years old, it is not uncommon to see all the teeth worn down, even with the gums.

The White Oaks have sweeter and more palatable fruit than the Black Oaks, and it is mostly from them that the Indians supply themselves. In California the large conical fruit of *Q. lobata* Nee is considered best by the natives who collect enormous quantities of it for winter use. Further north, that of *Q. Garryana* Dougl. is held in the same esteem. All the Live Oaks yield sweet palatable acorns, from the eastern *Q. Virginiana* Mill. to *Q. undulata* Torr., *Q. oblongifolia* Torr., *Q. pungens* Liebm., *Q. Emoryi* Torr., of the Rocky Mountain region, and Q. *Engelmanni* Greene, of Southern California. Our eastern Indians consumed large quantities of the acorns of *Q. Virginiana*, also obtaining from them a sweet oil much used in cooking; they, likewise, ate the acorns of *Q. Michauxii* Nutt. and *Q. prinoides* Willd.

Of the Black Oaks the only one affording food to the Indians is *Q. agrifolia* Nee, the Coast Live Oak of California.

Of the Walnuts and Hickories our Indians knew how to take full advantage, and sometimes from the nuts obtained delicacies apparently unknown to us; thus Bartram states that the Creeks pound the nuts and cast them into boiling water which is then passed through a very fine strainer; the thicker oily part of the liquid thus preserved is called hickory milk; it is as sweet and rich as fresh cream, and an ingredient in most of their cookery, specially hominy and corn cakes.

Our species of *Yucca* are not only handsome and ornamental, but the section *Sarcoyucca* of our arid southwestern territory produces fleshy, banana-like, fruits of agreeable taste, wholesome and nutritious. Unfortunately the fertilization of these plants, depending largely, if not entirely, upon the agency of certain moths, is often imperfect, so that well developed fruit is scant. *Y. baccata* Torr. is the most widely distributed of our species, ranging under several forms from Southern Colorado to Texas, California and Mexico. The ovate or cylindric, more or less beaked fruit is 3 to 5 inches long,with pulp about a half-inch thick over the large seeds. As birds and insects are very fond of this fruit and have the first chance at it, Indians and Mexicans collect it when still green and let it mature in their dwellings; they also eat it green after baking in hot ashes. The young flower buds, when about to expand, are roasted and a prized article of diet. I may also mention that the leaves of this very useful plant yield strong, flexible textile fibres, while the caudex and root are rich in saponin and an excellent substitute for soap. *Y. macrocarpa* Coville has a stout arborescent trunk 10 to 30 feet high and 1 to 1½ in diameter, and still larger fruit. *Y. Schottii* Eng., of Southern Arizona, also belongs to this section, as well as *Y. Treculeana* Carr., of Northern Mexico.

The Nymphaeaceae contain two plants whose seeds are, or were, highly prized by the natives, *Nelumbo lutea* already specially noticed for its roots, and *Nymphaea polysepala* (Eng.) of the northern Pacific slope. The former is called Water Chinquapin, from the resemblance of its seeds in shape and taste to the Chinquapin chestnut of the South; they are eaten raw or cooked and said to be even more delicate food than the roots. The latter plant differs from the eastern *N. advena* chiefly in having a larger number of sepals and a larger fruit; the pod is often the size and form of an egg, filled with well flavored and nutritious seeds which constitute one of the most valuable winter stores of the Klamath Indians.

The Ericaceae are rich in finely flavored fruits; the many species of *Gaylussacia*, *Vaccinium* and *Gaultheria* furnish the Indians with a notable proportion of their vegetable food. Two species of *Arctostaphylos* are likewise utilized by the natives of California, *A. Manzanita* Parry, the Common Manzanita of the coast range, and *A. tomentosa* Dongl., the Hairy Manzanita of the western part of the State. The small apple-like fruit is decidedly acid before maturity, tasting somewhat like an agreeably tart apple and used for making a cooling drink in summer. When ripe and dried, it is pounded and made into cake or bread.

The Mezquite (*Prosopis juliflora* DC.) is one of the most widespread of trees, ranging from the Atlantic to the Pacific, along the entire Mexican border, and from the Indian Territory, through Texas and Mexico, to South America. It thrives best on bottom lands, where it acquires somewhat the size and aspect of an apple-tree, but will grow almost anywhere, its long slender tap-roots dipping down to great depths in quest of moisture. On arid and fire-swept plains the spreading superficial roots absorb most of the nutriment, becoming thick and tortuous, while hardly any growth is visible above ground.

The Mezquite is invaluable to the Mexicans and Indians of our Southwestern territory, to whom it supplies food and fuel, and sometimes bad beer. The fruit is a yellow bean-like pod, 6 to 8 inches long, filled around and between the seeds with a sweet and very palatable pulp; it contains more than half its weight of assimilable nutritive principles, of which the most important is sugar in the proportion of 25 to 30 per cent. Most herbivorous animals, specially the horse, mule and donkey, are fond of this pod and thrive upon it.

A second species deserves mention, *P. pubescens* Benth., the Screw-Bean or Tornillo, so well characterized by the screw-like fruit. It is abundant from western Texas to California and southward into Mexico. The pulp of the bean is even finer than that of the Mesquite, but is too scant to be of much importance.

Another but very different plant of the LEGUMINOSAE affording fruit to the Indians is *Falcata comosa* (L.) Kuntze (*Amphicarpa monoica* Ell.), the Hog Peanut, a slender, twining perennial, ranging from Canada to Florida and westward to Dakota. The rudimentary lower flowers, borne on filiform creeping branches, bury themselves into the ground where they mature usually only one large fleshy, obovate or pear-shaped seed. This subterranean seed is edible and nutritious. I have seen the Indians dig it up in the spring as far north as Bismarck, N. D. The seeds of the pods on the upper branches, are said to be as good as peas for the table.

Along the banks of the upper Missouri and its many tributaries, grows the Bullberry (*Shepherdia argentea* Nutt.), a most abundant and ubiquitous shrub, sometimes forming miles of impassable thickets. The pistillate plant becomes covered with a profusion of small globose, nearly sessile, bright red berries, which contrast prettily with the bluish-white foliage; they are very acid and hardly edible until touched by frost in the early days of October, when they are sweetened and acquire a pleasant flavor. They have always been one of the staple foods of the Sioux and other Indians who eat them raw and stewed or mixed with other esculents. The whites use large quantities of them for making a delicious jelly, preferred by many to currant jelly. An analysis by Prof. Trimble gave the following constituents: water 71.28, nitrogenous substances 0.14, free acid (citric and malic) 2.45, total sugar 5.47, mucilage and pectin 0.42.

The other species, *Shepherdia Canadensis* Nutt, the Soapberry of the northern States and British America, bears yellowish-red, sweetish-acidulous and bitter berries; these, according to Prof. Penhallow, contain 0.74 per cent. of saponin to which they owe their persistent bitter taste and their well known property of foaming when triturated in a little water and beaten up; the thick cream-like, strawberry-colored foam thus produced is a favorite dish of the natives and, if sweetened, quite palatable. The berries are also preserved, dried or made into jam.

Another plant of this family, with edible fruit, is *Elaeagnus argentea* Pursh, the Silverberry of our northern middle States, and an attractive garden plant on account of its silvery-white foliage and the delicious fragrance of its flowers. The globose berry is dry and mealy and not at all appetizing.

The fruit or hip of several of our wild Roses, after being touched by frost, is sweet and palatable; as it persists through most of the winter, when hardly anything else is available, it sometimes becomes useful food to the natives as well as to birds and mammals. *Rosa Nutkana* Presl., the Nutka Rose, ranging from the northern Pacific coast to the Rocky Mountains, is the most showy of western Roses, having the largest flower and fruit; the latter is juicy and pleasantly acidulous and an excellent antiscorbutic for the Indians of Alaska.

Passing over the many native plants yielding edible seeds, specially of the Gramineae, I shall close with the notice of a few of those whose stem and foliage afford food to the Indians. In this connection the genus *Agave* is first to be mentioned; it is essentially Mexican, only a few species extending into our southern territory, and has always been of the greatest economic importance.

The sap of *A. Americana*, a species sparingly naturalized, but not indigenous, north of the Rio Grande, is converted into a weak alcoholic beverage called "pulque," the national drink of Mexico. Other species, baked, supply the "mezcal de comer," an excellent article of food, and also, by fermentation and distillation, a strong drink called "aguardiente mezcal." The edible part consists of the thick juicy base of the leaves, the fleshy axis and central bud, together forming the "cabeza" or head which is slowly baked in a pit or oven. In the raw state no sugar can be discovered in these plants, but only a citro-glucosid which by heat is converted into grape sugar and citric acid, so that, by cooking, the cabeza is rendered very sweet and pleasant to the taste.

Our Indians were not slow in learning the value of *Agave* from the Mexican natives; from time immemorial they have utilized our indigenous species, and wherever these grow can be found the stone-lined pits in which the mezcal heads are, or were, baked for food. As our native species do not yield sap enough for the production of pulque, and the process of fermentation and distillation is too complicated for native art, it follows that our Indians never obtained any alcoholic drink from them.

A. Parryi Eng. is the Mezcal of New Mexico and Northern Arizona, one of the staple foods of the Apaches. When properly prepared it is saccharine, palatable and wholesome, mildly acid, laxative and antiscorbutic. *A. Palmeri* Eng. takes its place in southern Arizona. *A. Wislizeni* Eng. is the common Mezcal species of the mountains of western Texas, while *A. deserti* Eng. is that of southern California and adjoining deserts.

On the mesas and foot-hills of western Texas and northern Mexico where *Agave* is rare, the observant Indians discovered a plant which takes its place and is equally useful, furnishing both food and drink. This is *Dasylirion Texanum* Scheele, the Bear-Grass of the Americans and Sotol of the Mexicans. When trimmed down, the head or edible portion consists entirely of the thick, expanded and imbricated bases of the leaves; it is refreshing and palatable even in the raw state, but of much better flavor when cooked. By fermentation and distillation, the Mexicans obtain from it a strong whisky called Sotol mezcal, of penetrating smell and peculiar taste, and the common alcoholic beverage of the frontier population.

The Lennoaceae have several interesting food plants, the principal of which is *Ammobroma Sonorae* Torr., the Sand-food, a leafless parasite in the sand-hills of southern Arizona and Lower California. The long fleshy stem, creeping in the sand, is edible raw and cooked, but specially palatable when boiled or roasted, the taste being variously described as that of a sweet potato or the heart of a cabbage. It is eagerly eaten by Cocopa, Papago and Yuma Indians, as well as by the Mexicans. It is a valuable substitute for water in the desert.

The Classification of the Archegoniates.

By Lucien M. Underwood.

There has hitherto been much looseness in the coördination of the groups of plants above what have been regarded the natural orders and at the same time wide difference in usage in group names. It is equally apparent that in some respects the botanists have followed a different system of nomenclature from the zoölogists, and they have not even followed a uniform or consistent system among themselves. While it is not possible to crowd a series of forms within the limits of a rigid classification, or accurately coördinate all natural groups of plants in equally related categories, it certainly is possible to follow certain broad principles and maintain a uniformity of nomenclature for the higher groups as well as for genera and species. Leaving particulars for further discussion there ought to be no difficulty in securing the adoption of the following system of group names and sequences:

SUB-KINGDOM.
  CLASS.
    ORDER.
      FAMILY.
        GENUS.
          SPECIES.

This is in skeleton the exact usage of the zoölogists and conforms more nearly with the greater portion of the more recent usage among those whose work is connected with cryptogamic botany. The differences that have been most prominent have arisen among the phanerogamic botanists, and some of the differences have even become almost hoary-headed from long usage. Indeed incipient baldness marks not a few of them, and perhaps a proper ventilation of some of the remainder will cause this to become even more apparent.

1. In place of the term *sub-kingdom*, so generally used by zoölogists, the term *series* has been used. The use of the former

must eventually be followed by all who deal in taxonomy, if consistency is to be maintained.

2. There has been a standing confusion of the terms *order* and *family*. The term "natural order" has a considerable antiquity, but has been confined Slargely to the Spermatophytes. While cryptogamic botanists have by no means been uniform in their terminology, they have in the majority of instances clearly distinguished these two group names. In this they have followed the lead of the zoölogists, for there would be no opportunity in animal classification to confound such distinct group names as the *order* Carnivora and the *family* Canidae. And yet the Ranunculaceae have been called indiscriminately a natural order (or simply an order) and a family. On account of this general confusion among the plants which are popularly the best known, it will be all the more difficult for a time to introduce a uniform and consistent system. And yet it seems to need no argument to show that there is no good reason for perpetuating this confusion in our terminology, and the stand taken on this point by the German systematists, and quite consistently carried out in a number of the most elaborate floras that have ever appeared in any country, will go far toward establishing the correct terminology.

3. There has also been a tendency to use the term *cohort*, much as we have used the term order in the proposed system. This was introduced by Lindley, and its adoption by Bentham and Hooker has had the tendency to fix its use especially in those quarters where other emanations from the same source have had much weight. As the Spermatophytes are not all of the vegetable world and much less not all of the domain of living things, it becomes a question when we broach the matter of uniformity of usage as to whether we shall follow a generally established principle or merely a localized usage. Since all zoölogists and the great majority of cryptogamists have already established the term *order* to include a group of families, it would seemingly be folly to attempt to adopt the term *cohort* in place of the term *order*. Here priority of use might well be argued in addition to the axiom that a part is not more important than the whole.

The adoption of intermediate groups such as sub-classes, sub-orders, sub-families and sub-genera can well be left to monographers of special groups, for their necessity will evidently vary in every group of plants. It would be a consummation devoutly to be wished if their use anywhere were restricted as much as possible, for a too extended and minute subdivision is not only not demanded by most groups of organic forms, but when introduced in excess tends more to confusion than otherwise and often obscures the real groupings of allied forms.

So far as uniformity of termination is concerned it would seem that the termination-*ales* could properly be adopted for orders and the termination-*aceae* for families where this would not interfere with long established names. In this connection uniformity would seem to be of more importance than priority, especially as the limitations of these larger groups have been so long a matter of uncertainty and variety of opinion. In the groups above orders, there would seem to be less necessity for uniformity of termination than in the orders and families themselves.

In order to illustrate the matter of uniformity of terminology and as a contribution toward securing this uniformity, I present the following arrangement of the sub-kingdom known as Archegoniata. It will be necessary as an introduction to state the limitation of that group as we understand it. In the present condition of our knowledge of plant forms, we can probably find no more satisfactory primary division of the plant world than the following, though of course we are still very far from a natural arrangement. It is practically the arrangement followed in the Engler-Prantl series* with minor modifications.

Sub-kingdom MYCETOZOA.
Sub-kingdom THALLOPHYTA.
Sub-kingdom ARCHEGONIATA.
Sub-kingdom SPERMATOPHYTA.

A few remarks may be to the point in explanation of this division, which in its lower half is necessarily artificial and unsatisfactory.

1. The slime moulds are evidently sufficiently distinct from other plants to warrant a separation in this way. That they have undoubted affinities with the animals no one can doubt, but it is equally clear that they have decided affinities with at least two

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* Die natürlichen Pflanzenfamilien, 2: 1, 1–2.

groups of plants, the bacteria and the moulds (Mucorini), that cannot be disregarded. While their structure and function causes them to stand somewhat midway between plant and animal, it would seem more consistent in a systematic arrangement to place them at the bottom of the plant world.

2. Until the inter-relations of the algae and fungi can be more definitely known and some suitable system devised that shall make it possible to unite allied forms on a rational basis, it will be best to maintain this unnatural and heterogenous group which we call Thallophyta. It is true, as has been stated, that the group is practically undefinable, but that is always true of the last division of any series in which those forms are placed that do not conform to any known natural arrangement. The close alliance of some of the lower fungi and algae absolutely precludes the idea of establishing these as primary groups, and of the various systems of subdivision that have been maintained there are none that seem to be founded on real or natural relationships. Unsatisfactory as the group is, we see no present improvement that can replace it.

3. As has been often maintained, there is not a wide distinction between a simple *Riccia* and some of the green algae, and the group Archegoniata is not entirely distinct at its lower limit. This, however, is true of any great group when its outliers are all known, for evolution has not yet resulted in the destruction of all the connecting links. We have for the same reason excluded the Characeae from this group because of their apparently stronger affinities with the other green algae. For a similar reason we have included the Gymnosperms at the upper limit because their affinities when properly understood seem to link them more strongly here than with the higher plants.

With these limitations we present the following outline of the classification of the Archegoniata.

Sub-kingdom ARCHEGONIATA.
    Class BRYOPHYTA.
        (*Sub-class Hepaticae.*) *
            Order Marchantiales.

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* I have placed these subgroups in parenthesis as representing group names that modern research seems destined to retire to a merited oblivion. I have elsewhere discussed their abandonment more in detail. *Cf.* Proc. A. A. A. S. 43: 259–274, 1894.

Family RICCIACEAE.
Family MARCHANTIACEAE.
Order Jungermaniales.
Family METZGERIACEAE.
Family JUNGERMANIACEAE.
Order Anthocerotales.
Family ANTHOCEROTACEAE.
(*Sub-class Musci.*) *
Order Sphagnales.
Family SPHAGNACEAE.
Order Andraeales.
Family ANDRAEACEAE.
Order Archidiales.
Family ARCHIDIACEAE.
Order Bryales.
(I omit the somewhat numerous families of this order as unnecessarily extending this illustration.)
CLASS PTERIDOPHYTA.
Order Filicales.
Family OPHIOGLOSSACEAE.
Family MARATTIACEAE.
Family HYMENOPHYLLACEAE.
Family OSMUNDACEAE.
Family SCHIZAEACEAE.
Family GLEICHENIACEAE.
Family POLYPODIACEAE.
Family CYATHEACEAE.
Family MARSILEACEAE.
Family SALVINIACEAE.*
Order Equisetales.
Family EQUISETACEAE.
Family CALAMARIACEAE (fossil).†
Order Sphenophyllales.
Family SPHENOPHYLLACEAE (fossil).†
Order Lycopodiales.
Family LYCOPODIACEAE.

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* See foot-note on preceding page.

Family PSILOTACEAE.
Family LEPIDODENDRACEAE (fossil).†
Family SIGILLARIACEAE (fossil).†
Family SELAGINELLACEAE.
Family ISOETACEAE.‡

CLASS GYMNOSPERMAE.
Order Cycadales.
Family CYCADACEAE.
Order Cordaitales (fossil).
Order Pinales.
Family PINACEAE. (*Coniferae.*)
Order Gnetales.
Family GNETACEAE.

The above classification is not proposed from the fact that it contains anything especially novel, but is merely an adaptation of the principle of uniformity in the terminology of the lower groups. So far as unlike things can be compared at all, the above families, as indicated, are groups equivalent with the so-called "natural orders" of the higher plants, e. g. *Ranunculaceae, Liliaceae, Orchidaceae*, etc.. The separation of the Gymnosperms entirely from the Spermatophytes will doubtless jostle with the ideas of those who still sandwich them in between the Monocotyledons and Dicotyledons, unaware of the modification that has taken place in our ideas of homology in the past two decades, while they have been asleep and failed to note the march of progress over their heads. In some instances it may be desirable to introduce a few subdivisions, but in the above I have purposely left them out except in one instance, that the simplicity of the arrangement might be the more apparent. They should not appear except for sufficient and well founded cause.

GREENCASTLE, INDIANA.

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* No lineal series of these families can represent their true affinities.

† The position of many of these fossil forms is still problematical.

‡ The position of this family is by no means permanently decided.

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Writers and publishers of botanical matter are earnestly requested to adopt the forms here recommended. Examples of various citations illustrating the application of the rules in specific cases are given. Correspondence may be addressed to Secretary of the Committee on Bibliography, 1284 Massachusetts Ave., Cambridge, Mass.

In each complete citation there should be given the following items:

a. Author's surname in full, followed by a comma.

b. Exact title, verbatim, following the capitalization required by the usage of the language in which the title is written, but not necessarily the capitalization employed.

c. Name of periodical or work, abbreviated in accordance with list of journals and catalogue of authors under recommendation 1. *a. b.*[*]

d. Series, if any, in Roman capitals.

e. Volume number in bold face Arabic numerals, followed by colon. In case there is no volume number, the number of the part, heft, lieferung, or fascicle is to occupy this place but is to be printed in Arabic numerals of ordinary face. When a volume is composed of parts separately paged the number of the part shall be written as an index figure to the volume number. Volumes in parts with continuous paging require no designation of parts.

f. Page, in Arabic numerals of ordinary face. In case paging of the paper is in Roman numerals these should be used, preferably small caps. Re-paging in reprints and separates is to be indicated by enclosing the numerals in parentheses. In case the original paging is unknown an em dash should occupy its place, the reprint paging being given in accordance with the foregoing rule. No individual or unique paging is to be cited under any circumstances.

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[*] See Proc. Mad. Bot. Cong. 45. Je 1894.

g. Figures, plates and exsiccatæ are to be printed in Italic Arabic numerals, the number designating the figure or plate to be preceded by the abbreviations *f.* and *pl.*, respectively, in Italics. *d.* following a page number may be used, when desired, to indicate description of a species.

h. Exact date must be given if possible, written in the mode and with the abbreviations for months used by Library Bureau.* The year at least must be given.

i. Punctuation. Except the comma following the author's name, and the colon following the volume number all the items are to be separated by periods. If another citation follows in the same line it is to be separated from the first by an en dash. Specific, generic and varietal names are to be written and punctuated in the method used in the "List of Pteridophyta and Spermatophyta" issued under the direction of the Botanical Club, A. A. A. S.

j. If it is considered desirable to give other data than series number (if any), volume number, page and date, these should be added in brackets after the date. But useless or unnecessary data should be avoided.

k. Citations of reviews, abstracts, and all such secondary references should be enclosed in parentheses.

Examples.

1. **Lagerheim, G. von.** Ueber das Vorkommen von Europæischen Uredineen auf der Hochebene von Quito. Bot. Centralb. **54**:324–331. 1893.
2. **Trelease, W.** A revision of the American species of Epilobium occurring north of Mexico. Rept. Mo. Bot. Gard. **2**:69–117. *pl. 1–48.* 22 Ap 1891.
3. **Sargent, C. S.**, Editor. Populus monticola. Gard. and For. **7**:313. *f. 56.* 8 Ag 1894.

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*Those abbreviations are as follows: Ja, F, Mr, Ap, My, Je, Jl, Ag, S, O, N, D; i. e., the initial of the month followed by the first distinctive letter.

4. **Dietel, P.** Die Gattung Ravenelia. Hedw. **33:** 22–48. *pl. 1–5.* 30 Ja. 49–69. 15 Ap 1894.

The foregoing are correct forms for catalogue by author. The following illustrate cases arising under the rules indicated by the letter preceding.

5. Ell. and Everh. Pyren. 491. My 1892.

6. **e.** Proc. Phil. Acad. **1894:** 53–59. 1894.

The year number, 1894, is the volume number, and not necessarily the year of publication. E. g.,

7. **e.** Bessey, Am. Pomol. Soc. **1885:** 42. 1886.

8. **e.** **Mez, C.** Bromeliaceæ. III. Flora Brasiliensis 115: 425–634. *pl. 81–114.* 1 F 1894.

Not Fasc. CXV, 425–634, t. 81–114.

9. **e.** **Saccardo, P. A.** Syll. Fung. $\mathbf{7^2}$: 481. N 1890.

10. **e. j.** Bull. Geol. and Nat. Hist. Surv. Minn. 9: 39–42. 2 Mr 1894.

Not 9^2; nor 9 part 2; nor 1894 [part 2].

11. **e. j.** Linn. Sp. Plant. $\mathbf{6^2}$: 125. 1852. [ed. Willd.]

12. **e. j.** **Gray, A.** Man. Bot. 225. 1890. [6th ed.]

13. **f.** **Peck, C. F.** Rep. N. Y. Mus. **47:** — (18). N 1894.

14. **g.** Ell. and Everh. N. A. F. *1642.* F 1889.

15. **g.** Rept. Mo. Bot. Gard. **2:** 98. *d. pl. 28.* 22 Ap 1891.

16. **i.** Beringer, Am. Jour. Pharm. **66:** 220 My 1894.—Tulasne, Ann. Sci. Nat. Bot. III. **7:** 85. *d. pl. 2. f. 3.* 1847.

17. **j.** **Bailey,** The Japanese plums in North America. Bull. Cornell Exp. Sta. 62: 3–36. Ja 1894. [Illust.]

The figures are not numbered.

18. **k.** Ell. and Kell. Jour. Myc. **1:** 12. *d.* Ja 1885.—(Hedw. **24:** 45 *d.* Je 1885.) Peck, (Grev. **22:** 111. Je 1894.)

Proceedings of the Club.

TUESDAY EVENING, FEBRUARY 12TH, 1895.

Vice President Allen in the chair and 29 persons present.

Lieut. Wm. Lassiter, 1st Artillery, U. S. Army, was elected an active member.

A communication from the Secretary of the Council of the Scientific Alliance of New York, transmitting a draft of a proposed act for incorporating the Council, was read. The matter was discussed by the chairman, Mr. Van Brunt, and the Secretary. On motion and unanimously carried, it was

Resolved, That this Society approves of the measure outlined in the proposed act of incorporation just presented by the Council of the Scientific Alliance of New York, and, so far as this Society is concerned, hereby authorizes the said Council to procure the passage of the said act by the Legislature and thereafter to carry the same into effect.

A communication from Professor Halsted, who was announced to speak on "Abnormalities in Plants due to Fungus Diseases," was read, stating his inability to be present.

The paper of Mr. Van Sickle, deferred from the last meeting was then presented, entitled "Notes from my Herbarium." The speaker exhibited and remarked upon a very large number of the rarer plants of northern New Jersey, representing numerous unrecorded localities and several species hitherto unknown to occur within the State. The communication was a very valuable addition to our knowledge of the distribution of the local flora and will be published in a subsequent issue of the BULLETIN.

Professor Britton read the announced paper of the evening, "The Family Ranunculaceae," outlining his proposed treatment of the group in the "Systematic Botany of North America."

WEDNESDAY EVENING, FEBRUARY 27TH, 1895.

Vice President Allen in the chair and about 165 persons present.

Miss Beatrix Jones was elected an active member.

The announced paper of the evening was then read by Mr. Cornelius Van Brunt, entitled "Wild Flowers in and about New

York City." The paper was illustrated by a large number of lantern slides made and colored from nature, the beauty of which elicited many expressions of admiration from the audience. The paper was discussed by the Secretary, who expressed the hope that those present would follow up their acquaintance with our wild flowers made from the lantern slides, by a personal acquaintance made in the field during the coming season, in connection with the excursions of the Club and of the summer class in botany. Dr. Britton called attention to the scientific features of such accurate illustrations, by which he had noted that a rare species of *Asclepias*, *A. decumbens*, not previously reported from this locality, occurred in the vicinity of New York. He also mentioned the strong contrast between the lowland and mountain forms of *Eupatorium purpureum* as endorsing his view that they were distinct species.

Dr. Britton called attention to two important publications, viz., 1, American Algae, Century 1, 1894, by Miss Josephine E. Tilden, of the University of Minnesota; 2, Phycotheca boreali-Americanae, fascicle 1, by Messrs. Collins, Holden and Setchell.

Index to recent Literature relating to American Botany.

Allen, T. F. Japanese Characeae—II. Bull. Torr. Bot. Club, **22**: 68–71. 26 F. 1895.

Describes *Nitella pulchella*, *N. subglomerata Japonica*, and *N. sublucens* as new.

Arthur, J. C. Black-knot and other Excrescences. Trans. Ind. Hort. Soc. 1894: 76–80. 1894.

Arthur, J. C. Discrimination of Diseases without the Use of the Microscope. Amer. Florist, **9**: 646. 22 F. 1894. Also Ann. Rep. Am. Carnation Soc. 1894: 8–14. 1894.

Describes seven or eight fungous diseases of carnation and tells how to recognize them aided only by a hand lens.

Arthur, J. C. and **Holway, E. W. D.** Uredineae exsiccatae et icones. Fascicle I. Decorah. pp. 4. *pl. 3.* 31 packets of specimens. S. 1894.

Contains 17 species of Lepto-Uredineae, with drawings of the spores on a uniform scale of magnification.

Bastin, E. S. Structure of *Cimicifuga*. Am. Journ. Pharm. **67**: 121–128. *f. 1–7*. Mr. 1895.

Bates, J, M. Notes on the Trees of Northern Nebraska. Am. Nat. **28**: 1034–1036. D. 1894.

Beach, S. A. Some Observations on the Life-history of *Plowrightia morbosa* (Schw.) Sacc. Ann. Rep. N. Y. Agr. Exp. Sta. (Geneva) 1893: 686–688. 1894.

An infection of young nursery stock from the conidia of 1892 (or possibly from ascospores of the following winter), produced an outbreak of the knots in June, 1893.

Bessey, C. E. Notes on the Distribution of the Yellow Pine in Nebraska. Gard. & For. **8**: 102–103. 13 Mr. 1895.

Britton, E. G. Contributions to American Bryology—IX. A Revision of the Genus *Scouleria* with Description of one new Species. Bull. Torr. Bot. Club, **22**: 36–43. *pl. 227*. 15 Ja. 1895.

Describes *S. marginata* from Washington and California.

Britton, E. G. Contributions to American Bryology—X. Bull. Torr. Bot. Club, **22**: 62–68. *pl. 229–231*. 26 F. 1895.

Discussion of *Physcomitrella patens* and *Aphanorhegma serrata* and a hybrid of the latter with some *Physcomitrium*, with plates.

Britton, N. L., and **Kearney, T. H., Jr.** An Enumeration of the Plants collected by Dr. Timothy E. Wilcox and others in Southeastern Arizona. Trans. N. Y. Acad. Sci. **14**: 21–44. Ja. 1895.

New species in *Aristida*, *Muhlenbergia*, *Mirabilis*, *Berberis*, *Cercocarpus*, *Erythrina* and *Kuhnistera*.

Budd, J. L. The Russian Thistle in its natal Home. Bull. Iowa Agr. Exp. Sta. 26: 30–33. 1894.

Campbell, D. H. Observations on the Development of *Marattia Douglasii* Baker. Ann. Bot. **8**: 1–20. *pl. 1–2*. Mr. 1894.

Campbell, D. H. The Origin of the sexual Organs of the Pteridophyta. Bot. Gaz. **20**: 76–78. 16 F. 1895.

Cheney, L. S. Leucoplasts. Bot. Gaz. **20**: 81. 16 F. 1895.

Chester. F. D. Report of Mycologist. Sixth Rep. Del. Exp. Sta. 1893: 103–132. Ja. 1895.

Gives treatment for Peach rot (*Monilea*); observations on rot of scarlet clover (*Sclerotina Trifoliorum*), *Colletotrichum* in cow pea seed and ripe rot (*Colletotrichum phomoides*) of tomatoes.

Collins, F. S., Holden, I. and **Setchell, W. A**. Phycotheca Boreali-Americana. Fascicle I. Malden, Mass. 1895.

Coulter, J. M. New or noteworthy Compositae from Guatemala. Bot. Gaz. **20**: 41–53. *pl. 5–6.* 16 F. 1895.

Describes *Vernonia Luxensis, V. Heydeana, V. Shannoni, Ageratum rugosum, Eupatorium griseum, E. vernonioides, Willougbaeya globosa, Mallinoa* (*n. g.*) *corymbosa, Polymnia Quichensis, Montanoa Samalensis, Verbesina Donnell-Smithii, Pereziopsis* (*n. g.*) *Donnell-Smithii,* with plates of the two new genera.

Coville, F. V. Report of the Botanist U. S. Department of Agricultrure for 1893. Rep. Secy. Agric. 1893: 235–244. 1894.

Crandall, C. S. The Russian Thistle. Bull. Col. Agr. Exp. Sta. 28: pp. 18. *pl. 6.* S. 1894.

Davis, B. M. *Euglenopsis;* a new Alga-like Organism. Ann. Bot. **8**: 377–390. *pl. 19.* D. 1894.

Deane. W. Notes from my Herbarium—I. Bot. Gaz. **20**: 12–15. 18 Jy. 1894.

Dewey, L. H. The Russian Thistle. Cir. Div. of Bot. U. S. Dept. Agric. 3: pp. 8. *f. 3.* 1894.

Eggleston, W. W. The Flora of Mt. Mansfield. Bot. Gaz. **20**: 72–75. 16 F. 1895.

Ellis, J. B. and **Everhart, B. M.** New Species of Ustilagineae and Uredineae. Bull. Torr. Bot. Club, **22**: 57–61. 26 F. 1895.

Species of *Ustilago, Entyloma, Uromyces, Puccinia* and *Aecidium.*

Foerste, A. F. Botanical Notes. Bot. Gaz. **20**: 78–80. 16 F. 1895.

Spreading of raspberry bushes and superposed buds and leaf scars.

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Gepp, A. Additional Notes on Mr. W. R. Elliott's Hepaticae. Journ. Bot. **33**: 82–84. Mr. 1895.

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Notes on some Florida Plants.

By Geo. V. Nash.

The section of Florida visited by me, and where I spent some five or six months collecting the flora, had never before been systematically explored botanically. One or two parties had collected for a few weeks in the winter season, but no one had spent any great length of time, and so it was practically a virgin field for the botanist. Its flora is most interesting, both in new and rare forms. The northern and tropical vegetation seem to overlap here. *Ximenia Americana*, a common West Indian shrub, and *Mitchella repens*, our common partridge berry, which has a far northern range, were equally common. This is a fair example of the extreme diversity of the forms.

Eustis, a beautiful little town in the high pine land country, was the centre of my operations. This is situated on a lake of the same name, some six miles long and three miles wide, connected with Lakes Griffin and Harris by the Ocklawaha River. It is about 25 miles from the Gulf, an equal distance from the Atlantic, and some 160 miles south of Jacksonville. I confined my operations to a radius of 12 miles of this place.

Lake county, a small section of which I explored, is situated in Central Peninsular Florida, right in the heart of the lake region. It seemed strange at first to find in a country where the soil is practically nothing but sand, such a superabundance of lakes. They are everywhere. Five or six can be seen at once from the tops of some of the slight elevations in the high pine land. They vary in size from only a few hundred feet to several miles. There are two groups of them: first, the large ones, which are really widenings of the Ocklawaha River, and second, the small, clear-water lakes. These latter are never very large, and the water contained in them is as clear as crystal. These are particularly numerous in the high pine land. They have no apparent inlet or outlet, and as a rule occur in deep depressions. How it is that the water remains so perfectly clear and limpid is hard to explain. Compared with our northern lakes, they contain little vegetation. *Potamogetons*, *Vallisneria*, and other forms so common in the lakes of the North, are entirely absent, and are to be found only in the Ocklawaha River and the large lakes alluded to above.

Another peculiarity about these clear-water lakes is their variation in elevation. The case of Lakes Alfred and Irma will illustrate this feature. They lie a little to the southeast of Eustis, and are only separated by a steep hillside some 500 or 600 feet long, Lake Imra being at the top of the hill. The difference in elevation is about 65 feet. One or two small streams, rising in this hillside, flow into Lake Alfred. But in spite of this its waters gradually lowered during the entire summer, and when I left in September the lake was nearly dry. The waters of Lake Irma, on the contrary, remained at the same level, although it is considerably higher and would be expected to drain into Lake Alfred.

As stated before, the flora of this section is very rich, and this fact is due to the exceeding variation in the physical features of the surrounding country. There are five well-marked areas, the flora of each one being different, and having certain plants peculiar to itself. These might be designated as: High Pine Land, "Scrub," Low Pine Land, "Bayheads" and "Hammocks."

Of these the high pine land is the greatest in extent. The tall timber is composed entirely of the long-leaved or yellow pine, *Pinus palustris*. The trees have perfectly straight trunks, rising to a height of 50 to 75 feet, the branches all being borne near the top, leaving the trunks entirely naked. The two other prevailing trees are *Quercus Catesbaei* and *Q. cinerea*, the shining bright green deeply cut leaves of the former making a strong contrast to the narrow entire and grayish-green foliage of *Q. cinerea*. The

Leguminosae are well represented, and in fact the members of this family predominate among the herbaceous plants. *Chapmania Floridana*, *Aeschynomene hispidula*, *Morongia angustata*, *Rhynchosia cinerea*, *Crotalaria Purshii*, *Cracca ambigua* and *C. chrysophylla* are the ones met with everywhere. Among the more frequent of the Compositae are *Berlandiera subacaulis*, *Pterocaulon undulatum*, *Cnicus spinosissimus Elliottii*, *Lygodesmia aphylla*, *Vernonia angustifolia*, *Hieracium megacephalon*, *Helianthella grandiflora* and *Liatris secunda*. Among other plants characteristic of this region are: *Tradescantia rosea*, *Asclepias amplexicaulis*, *Asimina pygmaea*, *Commelina angustifolia*, *Polanisia tenuifolia*, *Breweria angustifolia*, *Stillingia sylvatica*, *Croton argyranthemus*, *Jatropha stimulosa*, *Eriogonum longifolium* and *E. tomentosum*, *Portulaca pilosa*, *Ceanothus microphyllus* and *Piriqueta Caroliniana*. The grasses are represented by few species, but these occur in great numbers. *Aristida stricta*, *Sporobolus juncea*, *Andropogon argyraeus* and *A. longiberbis* are the commonest. There is only one member of the Cyperaceae that occurs in any quantity and that is *Stenophyllus Warei*.

The high pine land is subject to annual fires. The cattle growers burn off the old grass, so that the roots will start up and give a crop of young, succulent shoots. It is wonderful what a variety of features protect the plants against these destructive fires. *Pinus palustris* has a very thick bark at the base of the trunk, and the thickening is very noticeable in the shape of a sudden swelling just above the ground. All the herbaceous plants have large underground parts, tubers or thick roots, which store up nutriment and protect them. *Commelina angustifolia* has an immense fascicle of fleshy horizontally spreading roots, which anchor the plant deep in the ground and keep its soft, tender parts out of harm's way. *Tradescantia rosea* has a similar arrangement. The provision for the preservation of *Helianthella grandiflora* from extinction is even more noticeable. Buried in the ground, 6 or 8 inches deep, is an oblong tuber; the stem arising from this, instead of pushing abruptly upwards, continues horizontally, sometimes for a distance of 12 or 18 inches, and then rises obliquely to the surface; no matter how much the fire may damage the aerial portions, the plant has a supply of nutriment, enough to enable it to start up again at once. The above are only a few instances of the many means which insure the preservation of the different species.

The "scrub" flora is entirely different from that of the high pine land, hardly a single plant being common to both; in fact these two floras are natural enemies and appear to be constantly fighting each other. The only large tree growing in this region is *Pinus clausa*, which is markedly different from *P. palustris*, the pine of the high pine land. The latter is a tall, straight tree, with the branches restricted entirely to the top. *P. clausa*, on the contrary, is branched almost from the very base and does not attain a height of over 30 feet. Its needles are very fine, and it has received the name of the "spruce pine." The great part of the growth in the "scrub" is made up of scrub oaks, which are so variable that no two of them seem to be alike, and how many species there may be would be hard to tell. Only a number of years of close study in the field could determine this. *Ceratiola*, with its heath-like leaves, occurs here very abundantly. *Persea humilis*, a most beautiful little shrub, makes itself very conspicuous by its bright brown silky pubescence, which is noticeable a long way off. *Bumelia lanuginosa* is very common, as is *Ximenia Americana*. *Smilax Beyrichii* climbs all over the scrub oaks, and is the only one of this genus observed growing in the "scrub." One of the most beautiful plants of this part of Florida is *Breweria grandiflora*, with its large, bright blue flowers. The stems, with their peculiar gray-green erect leaves, spread out in all directions over the white sand. I remember one place, several acres in extent, where this plant reached its perfection, the stems sometimes eight or nine feet long, fairly covering the ground in all directions, with hundreds of the flowers in sight. It is remarkable that a plant of such luxuriance and beauty can thrive in an area so devoid of moisture as the "scrub," and yet it selects and confines itself exclusively to this region. Only one species of Cyperaceae is to be found here. This is *Rynchospora dodecandra*, and is quite common. Grasses there are absolutely none. For some reason this family is unable to obtain a foothold. Occasionally some member of the Andropogoneae tries it, but soon dies, not being able to stand the opposition it meets with for more than a few months.

I spoke above of the antagonism of these two floras. This is so marked that there is no mistaking it. Wherever they come together the line of division is very distinct. A bare space of pure white sand usually separates the two. On one side you will see the tall *Pinus palustris* as far as the eye can reach, and on the other the diffusely branched *P. clausa* of much lower stature. You may look in vain in the "scrub" for plants occuring in abundance just over the line in the high pine land, and *vice versa*. The strip of bare white sand dividing the two is neutral ground, and each seems to jealously guard against the other's gaining a foothold there. The soil of these two sections was apparently originally the same pure white sand. That in the high pine land is now darker in color, being probably due to the charcoal deposited there by the annual fires. This seems to be the only difference. As fires are of rare occurrence in the "scrub," the plants have made no provision against it, and so when a fire does go through it causes great havoc, almost entirely killing the pines and oaks. It is fortunate that fires are of such rare occurrence.

The flora of the low pine land region is not so distinct. It grades into that of the high pine land. Each has its separate and peculiar plants, but the line of demarcation is not so evident. *Pinus serotina* and *P. heterophylla* are the prevailing trees. Some of the plants which are peculiar to and characteristic of this region are: *Podostigma pedicellata*, *Trilisa odoratissima*, *Solidago Chapmani*, *Bejaria racemosa*, *Cracca hispidula* and *C. spicata*, *Eryngium yuccaefolium synchaetum*, *Rhexia ciliosa* and *R. serrulata*, *Bletia verecunda*, *Limodorum parviflorum* and *Juncus marginatus pinetorum*. The commonest member of the Cyperaceae is *Fimbristylis puberula*, which occurs in great abundance throughout the low pine land. *Aristida stricta* also occurs here, as well as in the high pine land. *Andropogon Floridanus* is quite common and a very showy member of that genus.

The low pine land occupies an intermediate position between the high pine land and the flatwoods. The latter is not represented near Eustis, and so I did not get a chance to do any collecting among that flora, which differs in a marked degree from that of any other section.

The large swamps, lying generally along the low pine land, have a peculiar flora and one quite interesting. These are locally known as "bayheads," so called, I presume, from the large number of bay trees, *Magnolia Virginiana*, that occur in them. The shrubs most prominent are *Pieris nitida* and *Leucothoë racemosa*. *Gordonia Lasianthus*, with its large white showy flowers, occurs in quantity along the margins. It ranges in height from ten to thirty feet, and when in full bloom is a very pretty sight. The plant most common, and which attracts the eye above all others, is the ever prevailing *Smilax laurifolia*. It climbs and clambers over all the shrubs and bushes, and makes the "bayheads" almost impenetrable. Here and there open places will be found where sphagnum grows in quantity, and in such spots one is almost sure to find *Utricularia fibrosa*, with its large showy yellow flowers. And in the very wet places *Peltandra sagittaefolia* makes itself conspicuous by its showy ivory-white spathes. *Andropogon brachystachys* occurs in the vicinity of "bayheads" and I found it no where else.

The soil of all the above, excepting the "bayheads," is pure sand, overlying a stratum of clay, the depth of sand varying from a few feet in the low pine land to as much as fifty feet in the high pine land. In places the clay comes to the top, and the character of the vegetation entirely changes. This forms what is locally known as "hammock land." It is a heavy clay soil, and is generally subjected to continuous inundation during the rainy season, which lasts from about June to September. *Quercus virens*, the live oak, is the principal tree, and often attains a great height. The most conspicuous object to the eye of a northerner is certainly the Cabbage Palmetto, *Sabal Palmetto*. It rises to a height of 50 to 75 feet, overtopping all the other vegetation. These trees are very plentiful and can be found in all stages of growth, from the young plant only a few feet high to the tall ones just alluded to. Until they attain a considerable size they retain the bases of the petioles of the old leaves. This gives the young palms a different appearance from the one they assume later when they shed these, exposing the slim symmetrical trunk to view. So unlike do they seem that at first sight it is hardly possible to believe that they can be the same in different stages of growth. In some sections the Golden Fern, *Polypodium aureum*, as well as the Old Man's Beard, *Vittaria lineata*, take possession of the trunks of the young palmettos, thrusting their roots down between the sheaths and the trunk. A palmetto thus adorned is certainly a beautiful object.

The blue palmetto, *Sabal Adansoni*, also occurs in the "hammocks." It never attains a height of more than three or four feet. Among the other plants restricted to the hammock lands are: *Tradescantia pilosa*, *Coreopsis Leavenworthii*, *Solidago Leavenworthii*, *Helenium nudiflorum*, *Teucrium Nashii*, *Berchemia scandens*, *Cardiospermum microcarpum*, *Eryngium Baldwinii*, *Ulmus Floridana* and *U. alata*, *Celtis Mississippiensis* and *Capsicum baccatum*.

Owing to this exceeding variation in the physical conditions of the country explored, I was enabled to secure a large number of species, some 800, several of them being new to science and others additions to the flora of the United States. The range of several plants was extended much further south. I also secured a number of rare things hitherto poorly represented in herbaria. The following are some of those of peculiar interest:

1153, 1180. CASTALIA RENIFORMIS (Walt). [*Nymphaea reniformis* Walt.]

This was found growing commonly in Lake Ella. There seem to be two forms of it, one growing along the shore, the other in water 10 to 20 feet deep. The two merged into each other, and a careful comparison showed them to be the same. The rootstocks of the shore form were secured and there was no indication of any tubers. The leaves varied from 6 to 8 inches in diameter in the shore form, to nearly 2 feet in the one growing in deep water. The edges of the latter were distinctly turned up, much as in the *Victoria Amazonica* and occurred in large masses, making it difficult to propel a boat through them. The flowers were long and entirely without odor, with the exception of a faint suggestion of that given off by apples.

815. HELIANTHEMUM NASHI Britton, n. sp.

Diffusely branched from a thick woody, horizontal root, the branches decumbent or ascending, slender, terete, densely stellate-tomentose even when old, leafy, 2–4 dm. long. Leaves oblong or linear-oblong, densely stellate-canescent on both sides, acute at both ends or the lower obtuse at the apex, 1.5–3 cm. long, 3–6 mm. wide, short-petioled, the margins somewhat revolute; flowers all alike in terminal leafy-bracted thyrsi; pedicels 2–5 mm.

long, divergent and ascending; outer sepals subulate; inner sepals oval-oblong, very obtuse, firm, concave, 3–4 mm. long; petals yellow, broadly cuneate, slightly eroded, 5 mm. long; stamens about 15, shorter than the petals; ovary globose, puberulent.

Nearest to *H. arenicola* Chapm., but very different in its thyrsoid, not corymbose, infloresscense, and obtuse inner sepals. It occurs in the "scrub."

14. STIPULICIDA FILIFORMIS n. sp.

A diffusely branched glabrous annual, of very slender habit, 1–2 dm. high. Radical leaves orbicular, acute, about 4 mm. in diameter, on slender petioles 5–7 mm. long; bracts triangular-subulate, about 1 mm. long; inflorescence capitate, 1–2-flowered; flowers about 1.5 mm. long, sessile or slightly stalked; sepals 5, scarious-margined, oval, obtuse, the inner 1.5 mm. long, 1 mm. broad, outer about two-thirds as long; petals 5, oblong, 2 mm. long, .75 mm. broad, entire or somewhat eroded at apex, minutely 3–5-toothed on each side near the base; stamens 3, opposite inner sepals; filaments linear, .75 mm. long, .25 mm. broad; anthers oval, .5 mm. long, .3 mm. wide; capsule globose, obscurely 3-angled; seeds more or less triangular in outline, flattened, less than .5 mm. long.

Differs from *S. setacea* in being much more slender; in the inflorescence, which is composed of fewer and sessile flowers, and in the shorter bracts.

One of the few plants that grow in both the "scrub" and high pine land. It prefers the latter, and attains a much more luxuriant growth there. Begins to flower in March and continues throughout the summer.

755. *Hypericum aspalathoides* Willd.

This has been considered as a variety of *H. fascicularis.* The two occur very commonly around Eustis and are clearly distinct species. The latter is found invariably around the lake shores and grows from 4 to 12 feet high, sometimes forming a small tree with a trunk 2 to 3 inches in diameter. The leaves are long and it flowers about the middle of April, maturing its fruit early in August. *H. aspalathoides* never occurs along the lake shores, but in the low pine land. It is a small undershrub, 1 to 3 feet high, has much shorter leaves, does not flower until five or six weeks later, and matures its fruit sometime in September.

673. *Hibiscus incanus* Wendl.

This has been put in with *H. Moscheutos* but it certainly appears distinct from that plant. Its flowers are always pure white with a deep purple centre. The leaves are softly pubescent on both sides, and are very seldom lobed at the apex, and when they are the lobing it is very slight.

378. *Cardiospermun microcarpum* Kunth.

Of frequent occurrence in the "hammock lands," climbing up the bushes and small shrubs. It appears to be new to the flora of the United States. It occurs in the West Indies, and so its turning up in Florida is not a matter of great surprise. It has much smaller fruit than *C. Halicacabum* L., which is very common in South Florida.

261. *Amorpha virgata* Small.

Mr. Small found this on Stone Mountain, Georgia, and it has now been found in Florida, several hundred miles further south.

1523. KUHNISTERA FEAYI (Chapm.) (*Petalostemon Feayi* Chapm.).

This occurs very commonly in both the "scrub" and high pine land. It forms large clumps 3 to 4 feet across. The flowers are a bright lavender. A white-flowered form was also found (No. 1524).

1336. RHYNCHOSIA CINEREA n. sp.

Perennial. Stems numerous, trailing, branching, 6–10 dm. long, 3-angled, striate, clothed with appressed cinereous pubescence; stipules brown, ovate, acuminate, 3–4 mm. long; leaves from 3–5 cm. long, 3-foliolate, terminal leaflet largest; petiole 11–20 mm. long, rachis 5–9 mm; leaflets appressed-pubescent above and on the veins beneath, somewhat rugose; lateral ones unequally ovate or orbicular-ovate, 13–23 mm. long, 9–18 mm. wide; terminal leaflet larger, orbicular-ovate to depressed-orbicular, 15–26 mm. long, 13–30 mm. wide; petiolules about 1 mm., covered with a dense cinereous, appressed pubescence; flower-clusters about as long as petiole; peduncle 3–5-flowered; pedicels slender, 1–3 cm. long; calyx somewhat 2-lipped; lower lip 3-parted, divisions lanceolate, acuminate, middle one 13 mm. long, a little exceeding the lateral ones; upper lip 2-cleft, teeth acuminate; ovary pubescent; pod oblong, obliquely acute at apex, 16 mm. long, 8 mm. broad, appressed-pubescent, 2-seeded; seed orbicular, flattened, 5 mm. in diameter, mottled brown.

Nearest to *R. tomentosa* Ell., which has a climbing habit, larger leaflets, a yellowish brown spreading pubescence, and the young pod densely pubescent, almost villous. In *R. cinerea* the pod is sparingly appressed-pubescent. Grows only in the high pine land region.

70. *Rubus cuneifolius* Pursh.?

There is some doubt as to this being this species, but more material is needed to decide the matter. It grows strictly erect and is armed with most aggressive spines. The leaves are much larger and the pubescence seems to differ. There is a specimen in the Columbia College Herbarium collected by Mr. A. H. Curtiss, No. 791, which appears to be the same thing.

1142. CRATAEGUS FLAVA INTEGRA n. var.

A small tree 4–5 metres high with spreading branches. Bark light gray; on new shoots reddish-brown; leaves obovate, more or less undulate especially at the apex, glandular on the margin, acuminate at base and narrowed into a slender glandular petiole, 10–13 mm. long. Fruit (not fully ripe) globose, on villous pedicels, 5–15 mm. long.

Collected in vicinity of Lake Ella in old fields, July 2. The fruit was green though apparently full grown. The flowers were not seen.

948. *Drosera capillaris* Poir.

This plant occurs in great abundance along the shores of the clear-water lakes, and seems to be confined to them. It never grows more than 2 or 3 inches high. There is another form which is also quite common, but it is much taller.

1218. RHEXIA FLORIDANA n. sp.

Whole plant of a dark olive green, diffusely branched from a woody base, 2–4 dm. high, branches ascending. Pubescence glandular-hirsute, spreading; leaves linear, 1.5–4 cm. long, 1–3 mm. wide, smooth on both sides, one-nerved, remotely and sharply spinulose-serrulate, acute, sessile, narrowed at base; flowers short-pediceled; calyx-tube cylindric-campanulate, sparingly glandular-hirsute, about 1 cm. long; lobes triangular to ovate-lanceolate, about 2 mm. long, 1 mm. broad at base; petals purple, mucronate, mucro about 1 mm. long; fruiting calyx 13 mm. long, neck 6 mm. long, 3 mm. in diameter, globose portion about 6.5 mm. in diameter; seeds snail-shaped, .6–.75 mm. long, irregularly ridged.

Very distinct and well marked. Its dark color and very narrow leaves readily distinguish it from all the other forms of this genus.

Found growing in quantity in wet clay soil on east bank of canal leading from Hicks' Prairie, near Eustis. Collected early in July.

515. *Œnothera sinuata* L. (?)

The stems of this plant are prostrate and 3 or 4 feet long, with leaves nearly entire or but slightly toothed. It appears quite different from the true plant, which is very common about Eustis.

865. *Melothria pendula* L. (?)

There are two forms of this occurring commonly. One, the ordinary plant, climbs over the bushes and tall weeds, and has thin sharply angled leaves with a broad open sinus at base. The other is always prostrate, and has thicker and more obtusely lobed leaves, with the sinus at base almost closed.

377. *Sambucus Canadensis* L.

This often attains a height of 10 to 15 feet, with a trunk 6 to 8 inches in diameter. Its leaves are very dark green and shining above, with long acumination.

892. *Cephalanthus occidentalis* L.

In the cypress swamps this often reaches a height of 30 feet, with a trunk 5 to 6 inches in diameter. The leaves are also correspondingly large, some of those measured being over 17 inches long.

730. *Richardia Brasiliensis* Gomez.

This appears to be new to the United States. It is evidently introduced, as it occurred only in one place along the railroad track, but it appeared at home and well established.

729, 1346. *Diodia hirsuta* Pursh.

Why this plant should have been put in with *D. Virginiana* is hard to understand. The mistake would certainly not have been made had the two been seen growing. They are entirely different. The latter is a glabrous plant with large thick leaves. *D. hirsuta* is very hairy with much smaller leaves and larger fruit. It occurs in dry sandy soil or in open swamps. In the former situation the stems are prostrate, forming mats on the ground.

In the latter they are only decumbent at base, being erect for the last 10 or 12 inches.

1183. *Garberia fruticosa* A. Gray.

Only a few specimens of this very rare shrub were secured. The plant seemed to be very common, but the flowers were scarce. It probably blooms much later. The shrub is some 4 or 5 feet high.

691. *Solidago Leavenworthii* T. & G.

This rare golden-rod is by no means common. It occurred in only one or two places.

1225. *Helianthella grandiflora* A. Gray.

The tubers of this showy composite exude a copious resinous matter.

1711. *Liatris secunda* Ell.

This is the *L. pauciflora* of the Synoptical Flora where the above name is cited as a synonym. It is clearly not the plant Pursh had in view; he divides the genus into two sections, tuberous and non-tuberous. The first contains the species now placed in *Liatris*, the second is composed of a number of plants, part of which are now put in *Carphephorus*, the others in *Trilisa*. *L. pauciflora* occurs in this latter group. The description given of it is clearly not that of a *Liatris*, as now understood.

390. Hieracium megacephalon n. sp.

Annual, whole plant generally of a purplish hue, stems 3–5 dm. high, channeled, strongly pilose especially at the base. Radical leaves broadly oblanceolate, 8–12 cm. long, 2–3 cm. wide, denticulate, pilose, particularly on the upper surface and the midrib beneath; cauline leaves oblong to oblong-ovate, decreasing in size towards the inflorescense, lower 4–6 cm. long, 1.5–2 cm. broad, truncate at base, sessile; inflorescence corymbose-paniculate, densely glandular-pubescent; involucre 8–10 mm. long; achenes fusiform.

Grows only in the high pine land. Flowers from March–May.

This seems to belong near *H. Gronovii*, and the achene certainly places it near that species. Its inflorescence, large heads, and dense glandular-pubescence clearly separate it from that plant. Moreover, *H. Gronovii* does not begin to flower in

Eustis until late in August, whereas this plant flowers early in the spring.

700. Xolisma fruticosa (Michx.)

(*Andromeda ferruginea fruticosa* Michx.) This certainly is specifically distinct from *Xolisma ferruginea*, which grows from 6–12 feet high, has light green leaves which are very much rolled in on the margins, and flowers early in March. *X. fruticosa* never attains a height of more than 6 feet, has a much stricter habit, very dark leaves which are not revolute, and does not flower until two months later. This difference is quite marked in herbarium specimens, but in the field there can be no mistaking it.

573. *Vaccinium stamineum* L.?

This occurs in very dry sandy soil, and has much smaller leaves than usual. They are thick, somewhat rugose and of a light green color. The true plant occurs in similar situations, but is much larger and thinner leaved.

941, 1698. *Fraxinus epiptera*, Michx.

In the herbarium of Columbia College there are two things placed under *F. platycarpa*. One of these has fruit over half an inch wide, elliptical in outline, gradually narrowed at each end. The other has linear-oblong fruit.* This latter I found in quantity in the cypress swamps and it is evidently distinct from the broad-fruited form. Its leaves are thicker and entire, or occasionally with very obscure serration. It grows from 20–50 feet high and fits very well the description of the *F. epiptera* of Michx., and I have called it that. The broad-fruited one is *F. platycarpa*.

796. *Asclepias Feayi* Chapm.

This was obtained in but one place, in the low pine land. Its pure white flowers, large in proportion to the size of the plant, make it very conspicuous.

419. *Asclepias decumbens* L.

This is very common in the high pine land country. Although it is hard to detect any difference between the flowers of this species and *A. tuberosa*, in the fruit the characters seem to be good. The latter has a pod about 3 inches long and ¾ of an inch wide, while in *A. decumbens* the pod is considerably longer than

* This is apparently [illegible] Caroliniana, [illegible]

this and hardly ½ an inch broad. The relative difference between length and breadth is very marked.

1092. ASCLEPIAS ACERATOIDES n. sp.

Perennial. Stems decumbent or erect, dark purple, simple or branched, terete, striate and puberulent; leaves smooth on both sides, those of the stem nearly orbicular or very broadly oblong, about 5 cm. long, 3.5–4 cm. broad, emarginate, rounded at base, on petioles about 8 mm. long; those of the branches oblong, 3–3.5 cm. long, 1–2 cm. broad, apiculate, more or less acute at base, on petioles 2–4 mm. long; umbels borne in the axils of the upper leaves, 20–50-flowered; peduncles puberulent, 2–3 cm. long; pedicels slender, puberulent, about 1.5 cm. long; sepals greenish, lanceolate, reflexed, acute, 2.5 cm. long; petals greenish, oblong-lanceolate, reflexed, obtuse, 6 mm. long, 2 mm. wide; lobes of the crown white with a greenish keel, flattened, semi-lanceolate, 5 mm. long, acute at each end, short-stalked; horn protruding from the middle of the lobe, horizontal, resting on the column, tip more or less ascending; column sessile, 2 mm. high; pod erect or ascending, puberulent, lanceolate, obtusely acuminate, about 8 cm. long, 1.5 cm. wide, on a twisted and reflexed thickened pedicel.

This plant very much resembles an *Acerates*. It grows exclusively in the "scrub," flowering late in June and through July.

1715. *Hydrolea corymbosa* Ell.

Occurs in swamps and is very scarce. I searched for it carefully, but failed to secure more than a few specimens. It grows in the tall grass and might be easily overlooked.

609. *Convolvulus repens* L?

This differs from the ordinary plant in having pure white flowers, the lobes of the leaves decidedly divaricate-spreading, the pubescence stronger, and in a distinct climbing habit. It may be only an extreme form.

770. BREWERIA VILLOSA n. sp.

Whole plant villous-pubescent. Stems several from a perennial root, simple or much branched, trailing; leaves oblong to oblong-ovate, 2.5–7 cm. long, 7–20 mm. broad, obtuse, apiculate, rounded at base, on petioles 2–8 mm. long; peduncles equalling or exceeding the leaves, 1–7-flowered; bracts shorter than the pedicels; sepals oblong to ovate-lanceolate, 8–11 mm. long, 3–4 mm. broad, acuminate, villous; corolla 1.5–2 cm. long, white; filaments filiform-subulate, two-thirds as long as corolla, adnate and villous for two-fifths their length, lower part of free portion pubescent; anthers 1.5 mm. long; ovary villous, 2-celled, cells 2-ovuled; styles 2, adhering for one-third their length; capsules on erect pedicels, ovate, villous at apex, 2-celled, cells 1-seeded; seeds yellowish brown, ovate, compressed, flat on one side, 5 mm. long, 3 mm. broad.

Found in low lying oak land in the vicinity of water. Nearest to *B. aquatica* but readily distinguished by its larger white corolla, villous filaments and adhering styles.

Nos. 771 and 1508 appear to be the same. They have larger and thinner leaves and are not so villous. They grew in more shaded situations, and this probably accounts for the variation in the leaves and pubescence. In No. 770 the peduncles almost invariably exceed the leaves and are many flowered. In Nos. 771 and 1508 the leaves and peduncles are nearly equal, and the latter often only 1-flowered.

971, BREWERIA ANGUSTIFOLIA n. sp.

Stems numerous, from a perennial root, trailing, slender, 8–10 dm. long, more or less depressed-pubescent. Leaves narrowly linear, 2.5–7 cm. long, 1.5–3.5 mm. broad, glabrous or pubescent, acute, sessile or on petioles not exceeding 2 mm. in length; peduncles slender, 1-flowered, about equaling the leaves, appressed-pubescent; bracts shorter than the pedicels; sepals elliptical to oblong, acute, smooth, ciliate, 7–10 mm. long, 2.5–3 mm. broad; corolla white, about 2 cm. long; filaments villous with jointed hairs, about one-half as long as coralla, adnate for one-third their length; styles 2, three-fourths as long as coralla, adnate for one-third their length; ovary villous at apex; capsules 8 mm. long, on recurved pedicels, oval, acute, with a tuft of hairs at the apex, 2-celled, cells 1-seeded.

Grows only in the high pine land region, where it is very abundant. It has been confused with *B. humistrata* and *B. Pickeringii,* from both of which it is evidently distinct. It differs from the former in its larger flowers, very narrow leaves, invariably 1-flowered peduncles, and 2-seeded capsule. From the latter it can be separated by its much shorter bracts, villous filaments, styles adnate for a much shorter distance, and like the stamens, included.

1299. *Utricularia resupinata* B. D. Greene.

Occurs very plentifully along the shores of several of the clear-water lakes. A few specimens of it were secured by Dr.

Garber and Dr. Porter was the first to note the extension of its range into Florida. It seems to have been reported from no intermediate stations.

248. *Utricularia oligosperma* St. Hil.

This is the largest of its genus occurring in Florida. It is found in both the rivers and lakes, and is quite common. It reaches its perfection in Lake Ella, where the stems often attain a length of 6 to 8 feet and the branches spread 2 to 3 feet. The growing end is of a beautiful pink color, the middle portion a dark green, and the decaying end a rich brown. It is entirely floating, forming a beautiful object spread out in the water, and looks like a large sea-weed. Its flowers are an inch in diameter and yellow. It is found in South America, and the extension of the range to central Florida, where it is evidently indigenous, is remarkable. On a specimen of a *Utricularia* in the Columbia College Herbarium, collected by Dr. Chapman, is a note to the effect that the plant appeared in the bay at Apalachicola in 1842, but entirely disappeared in a short time. This specimen proves to be this same thing.

974. *Boerhaavia decumbens* Vahl.

This plant was very plentiful, much more common than the other species growing with it, *B. erecta.* It always occurred in cultivated ground or its vicinity and may be introduced. I cannot find that it has been reported from the United States before.

1185. *Paronychia herniariodes* (Michx.) Nutt.

This rare plant was found growing quite freely in one locality near Tavares. It occurred in dry sandy soil just west of the railroad bridge crossing the Ocklawaha River. It had been previously known only from Georgia and North Carolina.

435. *Persea pubescens* (Pursh) Sargent.

Dr. Chapman published this as a variety of *P. Carolinensis.* It has several well-marked characters which seem sufficient to justify its elevation to specific rank. In *P. Borbonia* (L.) Spreng. (*P. Carolinensis* Nees) the leaves and inflorescence are glabrous, the peduncles equaling or shorter than the petioles, and fruit fully a half inch in diameter. In *P. pubescens* the leaves and inflorescence are strongly pubescent, the peduncles generally much exceed the petioles, and the fruit is but little more than half as large, of a light blue color.

574. PERSEA HUMILIS n. sp.

A compact shrub, 2–3 metres high, with branchlets, young leaves, and whole inflorescence covered with a dense bright brown sericeous pubescence. Branches dark slate-color; leaves from elliptical to oblong, 4.5–8.5 cm. long, 2–3 cm. wide, more or less revolute on the margins, acuminate at both ends, obtuse at apex, yellowish green, smooth and slightly shining above, blackish and pubescent beneath, the midrib very prominent; petioles from 1–2 cm. long; inflorescence capitate; peduncles stout, 4–7 mm. long, generally 3-flowered; flowers about 6 mm. long; sepals erect, obtuse, outer ones oval, 2 mm. long, shorter than the stamens, inner oblong, 5 mm. long, exceeding the stamens; fruit purplish black with a bloom, globose, 15 mm. in diameter, on peduncles about 15 mm. long; seed globose, 11 mm. in diameter.

This seems to be nearest to *P. Borbonia* (L.) Spreng. It differs in its smaller size, shorter, stouter and fewer-flowered peduncles which elongate in fruit; and especially in the dense brown sericeous pubescence of the young leaves and branchlets. This latter feature makes the shrub very conspicuous, and seems to be unusual in the genus. This, moreover, flowers some five weeks later than *P. Borbonia.*

Occurs exclusively in the "scrub," where it is very common. Collected at Eustis in flower in May. Fruit kindly collected on November 8th at the same place and sent to me by Mr. W. T. Swingle.

1397a. CROTONOPSIS SPINOSA n. sp.

An erect much branched annual, 4–7 dm. high, clothed with stellate-pubescence. Branches erect; leaves linear to linear-oblong, 1.5–3 cm. long, 2–5 mm. broad, acute at both ends, on petioles 1–2 mm. long; fruit spiny; seeds ovoid to ellipsoid, only slightly flattened, 2 mm. long, 1.5 mm. broad, minutely pitted.

Differs from *C. linearis* in having a more strict habit, smaller and much less flattened seeds, narrower leaves, and fruit covered with spines.

Collected by Mr. W. T. Swingle at Dunellon, July 24.

1700. *Habenaria blephariglottis* (Willd.) Torr.

Evidently an abnormal form of this plant. Its parts are nearly twice as large as usual. Some of the flowers are slightly tinged with orange.

6. Limodorum parviflorum (Lindl.) (*Calopogon parviflorus* Lindl.)

Quite common in the low pine land. It grows from 6 to 12 inches high. Its flowers are deep purple, much resembling those of *L. tuberosum* of the north, which is also common, but flowers much later. *L. parviflorum* was in full bloom early in March.

557. Stenorrhynchus Jaliscana (Watson.) (*Spiranthes Jaliscana* Watson.)

Finding this plant in Florida was a surprise. It was previously known only from Mexico.

857, 1703. *Tillandsia juncea* Le Conte.

This has been placed with *T. setacea* Sw. by Mr. Baker, in his monograph of the Bromeliaceae. The two are very common where I collected and are clearly distinct. *T. setacea* has erect setaceous leaves, very narrow at the base while in *T. juncea* the leaves are much stouter, with a much broader base, and are conspicuously recurved. The specimens in the Columbia College herbarium collected by Dr. Chapman and so named are evidently another species, the *T. Balbisiana* R. & S. Le Conte says [Ann. Lyc. N. Y. **2**: 131 (1828)] that his species very much resembles the figure of *Bonapartea juncea* in Flora Peruviana, *pl. 262*. The plant referred to above certainly does bear a strong resemblance to this figure.

1562. *Yucca filamentosa* L. var.

There are two forms of *Y. filamentosa* occurring in this region. One flowers in May, has conspicuously twisted leaves which generally are strongly recurved and rather short, and matures its fruit in July. The other is taller, has whiter flowers in a larger panicle, longer and more erect leaves which are narrower in proportion, and does not flower until August. They grow in similar situations. With these differences it hardly seems possible that they can be the same.

459. Nolina Brittoniana n. sp.

Roots a cluster of long spreading fleshy fibres. Radical leaves 40–70, recurved and prostrate, forming a dense mass around the base of the plant, linear, 1–2 metres long, 5–10 mm. wide, strongly scabrous on the margins, attentuated into a long slender point; cauline leaves setaceous, 1–3 dm. long, about 1 cm. broad at base; stem arising from a bulbous base, 1–2 metres high; inflorescence paniculate, ovoid to oblong in outline, 3–4 dm. long; flowers in clusters of 2 or 3 on erect pedicels 3–5 mm. long; perianth segments elliptical to elliptical-ovate, 4 mm. long, 2 mm. wide, glandular at apex; filaments flat, broadly subulate, 2 mm. long, .5 mm. broad; anthers 1.5 mm. long; cells oblong, .75 mm. broad; ovary 3-celled, orbicular-ovoid, truncate, somewhat triquetrous; stigmas sessile; capsule orbicular, on slender recurved pedicels about 1 cm. in length, 8–9 mm. long, 10 mm. broad, cordate, retuse, triquetrous, 2 of the cells 1-seeded, the other generally empty.

Grows in dry, sandy soil in the high pine land region. Sometimes five or six plants occur together, and then it makes a very showy appearance in flower.

This plant is named in honor of Dr. N. L. Britton who has given me much help and advice in working up my collections, and to whom I wish to extend my thanks for his many kindnesses.

1389. *Xyris platylepis* Chapm.

This is found in the low pine land region and occurs with either white or yellow flowers (No. 1377.), the former by far the more frequent.

954. *Xyris torta* Sm.

This is the commonest species, inhabiting the low pine land. It invariably has white flowers, a fact which does not seem to have been noted before.

1584. XYRIS SMALLIANA n. sp.

Plant smooth, glabrous and shining throughout. Leaves about one-half as long as scape, linear, 3.5–6 dm. long, 3–9 mm. wide, striate, the lower half purple; sheath from 2.5–4 dm. long, striate, with a blade from 1–10 cm. long; scape erect, scarcely striate, 7–10 dm. tall, nearly terete, 1-edged throughout, flattened and 2-edged just below the head, one edge being much more prominent; heads ellipsoidal, about 2 cm. long, 1 cm. in diameter when mature, ovoid in the early flowering state; scales orbicular-obovate, entire, 5–6 mm. long, 3–5 mm. wide; lateral sepals conspicuously exserted, 8 mm. long, 1 mm. wide, curved, wing gradually broadening to the top where it is from one-half to two-thirds as wide as the sepal, lacerate-fimbriate for the upper third; petals yellow; capsule obovoid, obscurely triquetrous, placentae parietal; seeds from cylindric-oblong to cylindric-obovoid, more or less curved, pointed at both ends, striate, about .6 mm. long, .2 mm. wide.

Growing in shallow water at Lake Ella and in very wet soil along edge of cypress swamp north of Trout Lake, near Eustis. No. 539. *X. torta* and *X. fimbriata* are the only other species in the United States with exserted sepals, the former with white petals.

1525. COMMELINA SWINGLEANA n. sp.

Stems 1–3 dm. high, smooth, sparingly branched, prostrate or ascending, from a compact fascicle of descending fleshy roots 3–5 cm. long; sheaths inflated, 6–9 mm. long; leaves linear to linear-lanceolate, 4–6 cm. long, 5–7 mm. wide, glabrous or slightly pubescent; peduncles about 5 mm. long, pubescent; spathe more or less pubescent, 2 cm. long, 1 cm. broad, falcate-acuminate, rounded posteriorly; the two large petals deep blue, reniform, 12 mm. long, 17 mm. broad, claw 3–4 mm. long; capsule depressed-globose, 5 mm. long. 4 mm. broad, obscurely 3-lobed, 3-celled, cells 1-seeded; seed broadly oval in outline, somewhat compressed, flat on one side, smooth, dark-brown.

The stems of this plant are generally prostrate, about 1 dm. long; occasionally one is found with longer and ascending stems, but they are very rare. Collected in the high pine land region at Umatilla early in August.

There are two specimens in the Columbia College herbarium which evidently belong here, one collected by Dr. Chapman, and the other by Mr. Blodgett at Key West.

Near to *C. humipila* Sauvalle, of the West Indies. That is diffusely branched; has a smaller seed, gray in color, narrower and longer leaves, longer sheaths, not inflated, and an ovoid capsule.

Named in honor of Mr. W. T. Swingle, Director of the Sub-Tropical Laboratory at Eustis, to whom I wish to extend my thanks for the many favors shown me. His knowledge of the country and flora, which were freely imparted, enabled me to make much more valuable and extensive collections than would have otherwise been possible.

1015. *Peltandra sagittaefolia* (Michx.) Morong.

Occurs in the bayheads, generally among sphagnum. It is by no means common.

148. *Lachnocaulon Beyrichianum* Sporleder.

This is another rare plant, but very common around Eustis, along the shores of the clear water lakes. It grows in small tufts, generally among tall grass.

1295. *Lachnocaulon Beyrichianum* Sporleder?

Appears to be the same as No. 148, but the heads are much larger than the original description calls for.

1407. *Cyperus leucolepis* Carey.

This rare plant was previously only known from a single collection. I found it growing quite freely in one place at Eustis. Its silvery white scales make it very conspicuous among the tall grass.

STENOPHYLLUS FLORIDANUS Britton, n. sp.

Similar to *S. capillaris*, culms filiform, erect, 10 cm. to 20 cm. tall, much exceeding the thread-like leaves. Sheaths ciliate; spikelets linear, acute, several-flowered, rich brown, 4 mm. to 8 mm. long, 1 mm. wide, sessile and densely capitate in 4s to 10s at the summit; scales ovate-lanceolate, keeled, about 1 mm. long, with a minute slightly spreading tip; achene obovoid, 3-angled, light-colored, slightly longer than thick, the angles rounded, the faces somewhat concave, the whole surface cellular-reticulated, its cells oblong; style glabrous, 3-cleft for about one-fourth its length.

Dry sandy soil, high pine land.

566. *Setaria flava* Kunth.

This appears to be new to the United States.

1382. *Setaria Ventenatii* Kunth.

Also an addition to the flora of the United States.

831. *Marsilia vestita* H. & G.

This was found growing in abundance at Orange Bend, the same place from which Prof. Underwood reported it. The plant occurs along the track on both sides of the depot for about one-quarter of a mile. It is confined to that limited area so far as I could find out. Its occurrence at such a distance from its ordinary range and its limitation to this small section point very strongly to its being introduced.

John H. Redfield.

By Wm. M. Canby.

(with portrait.)

On the banks of the beautiful Connecticut and near the center of the State of the same name is to be found the place anciently and still called Middletown; and, in accordance with a custom nowhere so common as in New England, of retaining for offshoots from the original settlements the name of the mother town with a prefix or a suffix, the little hamlet, a few miles up the river, was of old called by the somewhat picturesque name of "Middletown Upper Houses," now, alas! changed to the unmeaning one of Cromwell. Here, on July 10, 1815, the subject of this sketch was born. He could claim John and Priscilla Aiden among his ancestors and was in every way of pure New England blood. Many of his family had been sea captains, a vocation nowhere represented by more honorable, hardy and vigorous men than on our northern coast. His father, William C. Redfield, at this time a country storekeeper in humble circumstances, was a man of enterprising character and of an unusually inquiring and vigorous mind. The son only knew his mother as an invalid and she died when he was but four years old; and although his father married afterward, he was again bereaved; so that his son owed much of his good bringing-up to a widowed relative who came to take charge of the household and who, according to the custom of those days, did not stint the lessons to be derived from the "New England Primer" and the "Shorter Catechism." Other lessons, more pleasant perhaps, came to him early from his father and served to stimulate his inherited scientific tastes.

The following pleasant account is of one of these which occurred when he was six years old during a long ride taken soon after the storm long known as the "Great September Gale."* "My father's habits of close observation led him to watch the fallen trees and the effects of that destructive wind. At Middletown the wind had been from the southeast and the trees lay with their heads northwestward; but on reaching Berkshire he was surprised to see that they lay in an opposite direction and he repeatedly called my attention to the fact. In conversing with the residents of that region as to the time these trees were prostrated he was still more astonished to learn that the wind, which at 9 P. M. had been from the southeast at Middletown, had been at Stockbridge from the northwest precisely at the same hour. * * * * It did not appear to him possible that two winds of such violence should be blowing against each other at the distance of only seventy miles. The only explanation of this paradoxical phenomenon was one which he was then led to accept hypothetically, but which he afterwards confirmed by years of observation and innumerable facts." It was thus that the elder Redfield was led to the theory of the rotary as well as progressive movement of storms which procured him so much note as a meteorologist.

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* See Oliver Wendell Holmes' poem "The September Gale."

Our friend's first public education came from the district school, which his father had taken great pains to have above the usual standard. In addition, there were the "spelling classes" and "friendly associations," and a small circulating library—agencies which he acknowledged to have been helps to him in his aspirations for knowledge, as they have been to many others. Of the effects of the "spellling class" exercises he says: "I am foolish enough to believe that those winter evening battles were more useful and creditable than some of the athletic contests which in these days are doing so much to brutalize young men, and which, by their attendant betting leading to the worst results of gambling, are tending to make old and thoughtful men raise the question whether colleges are not becoming institutions to be avoided."

Of books at this time there were but few, but all he could get he read with avidity. Like every one else, he was fascinated with Bunyan's Pilgrim's Progress, both as to the story and the quaint old prints. He writes: "That of Apollyon's battle with Christian so excited my imagination that when, being a little older, I was sent to the wood pile in the fast darkening twilight of a winter afternoon to bring in the evening supply of wood, I never felt altogether secure from that dreadful demon until the last armful was fairly in;" which leads one to wish that these Apollyons would always scare the bad boys and never the good ones.

One other book, forgotten now perhaps, gave him the bent towards botany, which afterwards so much occupied him. This was Thornton's Grammar of Botany.

About this time steam navigation was occupying the father's mind and after some efforts in that way on the Connecticut his attention was turned to the Hudson. He was thus frequently in New York for long periods while the son's education was continued for a year and a half at Stamford. Finally, in 1824, the family was removed to New York. The boy was now sent to the High School where, under the influence and instruction of one of the teachers, a Mr. Barnes, he was instructed in mineralogy and had many a pleasant ramble in the country in his company. His school education was finally completed by a short course which he provided for himself at a private school, but between these two periods he attended the chemical lecture course of Dr. Torrey, an association which must have had great influence in his pursuits in after life. His first business occupation was in a dry goods store, where he continued long enough to acquire a thorough detestation of it. He then assisted his father in his steam transportation ventures and this occupied his business hours for many years. It is of more interest to us to know that his love of science continued and was intensified when, in 1836, he became a member of the New York Lyceum of Natural History, of which Dr. Asa Gray was then the Librarian and Superintendent. Here was commenced that friendship which was destined to be close and lasting. It was at this time that he acquired a taste for conchology, in which he made much progress and which resulted in a number of papers on this subject published in the Annals of the Lyceum. He thoroughly explored the country in the vicinity, over land much of which is now probably closely built upon, and in every way which the time at his command and his means permitted strove to advance the scientific interests of himself and his associates. As early as 1846 he became a member of the Academy of Natural Sciences, of Philadelphia. In 1843 he made a very happy marriage and this, perhaps, was the eventual cause of his removal to

Philadelphia in 1861, where he long held a prominent position in the extensive and well-known car wheel works of A. Whitney & Sons, with the members of which his marriage connected him. His allegiance was necessarily transferred from the Lyceum to the Academy, of which he soon became a life member, and was gradually advanced to many of its most important and laborious offices. Thus, in 1870, he became a member of its Council and was also made Conservator of its Botanical Section, the latter a most important office as it placed the various and very important herbaria in his charge. He was Corresponding Secretary of the Conchological Section in 1879, and after having been long a member of its Publication Committee was made its Chairman in 1891. It will thus be seen how important his services were to this institution and how great the esteem in which his good sense and active exertions as well as his wise and thoughtful counsel were held by his associates. But beyond all this, and especially after his retirement from business cares in 1885, he accomplished a great work which no one else connected with the Academy had time to do and for which, indeed, no one was better fitted than he. When he took charge he found four distinct herbaria as follows: that of Dr. C. W. Short; that of Schweinitz, composed principally of Fungi, very many of them types; the General Herbarium, and the North American Herbarium, the latter of which is of the utmost value, not only because of its size and completeness, but also because it contains a large number of the type specimens of Nuttall, Pursh and others of early botanists of this country. The specimens in these were loose in sheets of paper, very often those of more than one collector huddled in together, with the labels but loosely attached to the specimens. With great care and good judgment, and an indefatigable energy, he brought order out of this confusion, so that at last he had got the greater and more·valuable parts of the herbaria arranged and mounted and properly catalogued. Nor did his benefations end with this, for he purchased all valuable sets of plants and bestowed them upon the Academy. The tender and appreciative minute adopted by it and hereafter appended is but a fitting testimony to his usefulness and unselfish devotion.

Mr. Redfield lived for many years in one of the pleasantest parts of Philadelphia and quite close to the Academy. He made occasional botanical excursions, of which notable ones were to the mountains of North Carolina in company with Dr. Gray and other botanists. There could not have been a more delightfully cheerful and obliging travelling companion. The writer well remembers that on one occasion when at Linville Falls, in what was then the wildest and least frequented part of the country, Mr. Redfield "turned up missing," to the serious concern of the rest of the party. After considerable search he was found sitting on a mossy bank, writing up his diary with the utmost serenity, cheerfully answering anxious inquiries by saying, "Oh, I knew you would come for me." In later years his summers were spent on Mt. Desert Island. The excellent catalogue of its flora lately published by Mr. Rand and himself attest his industry while there.

It is impossible to speak too highly of Mr. Redfield's personal character. Honorable, sincere, courteous, cheerful, always ready to do a kind act or to say a gracious word, he displayed that true nobility of character which comes of right principle faithfully adhered to, yet without a trace of aceticism or austerity.

Mr. Rand writes: "He was always being good and doing good. I have letters lamenting his death from young botanists, whose names even he may not have remembered or known, all telling the same story,—'he was so good to us, so kind in his interest and help, so courteous to us in our ignorance.'" The Rev. Dr. Dickey said of him: "I have touched many good lives and found pleasure and example in close intercourse with many, * * * * but I have never touched a smoother life than this. * * * It was not the quietness of silence—it was like the soothing murmur of a mountain brook; there was a beauty and fragrance like the beauty and fragrance of wild flowers, in this simple yet vigorous life."

And so one cannot wonder that he won sincere and lasting affection and left a bright example of a right-living, true-hearted and attractive gentleman. Once, indeed, the serenity and happiness of his old age was broken by the stroke of a severe bereavement; but it only the better showed the strength of his character.

> "And the more
> Fate tried his bastions, she but forced a door
> Leading to sweeter manhood and more sound."

After some weeks of failing health he died on the twenty-seventh of Febrauary last, in the eightieth year of his age.

A beautiful western grass, the *Redfieldia flexuosa* commemorates his name and services.

Appended are testimonials of learned societies and a bibliography.

FROM THE ACADEMY OF NATURAL SCIENCES.

The Academy of Natural Sciences of Philadelphia has heard with deep sorrow the announcement of the death of John H. Redfield, who, in his unselfish devotion to its interests, has long been one of its most active benefactors.

Always an earnest student of nature his last years of deserved freedom from business engagements were devoted to his favorite studies in connection with the Academy, and to the arrangement and care of the Herbarium.

The steady growth and admirable condition of the botanical collection constituted an enduring memorial of his industry and zeal.

As Chairman of the Publication Committee and Member of the Council the same fidelity and discretion characterized the discharge of his duties.

He was a man of strong but tender character; firm in his support of the right, but tolerant of all honest difference of opinion; cheerful, gentle, modest and cultured. Time to him was one of his most precious possessions, yet he was ever gladly at the service of those requiring advice or assistance.

He was an earnest student, a wise counsellor and a steadfast friend. His encouragement and loving sympathy endeared him to his associates, who felt for him a personal affection which enables them to appreciate the irreparable loss sustained by his family, to whom they would offer their heartfelt sympathy.

FROM THE NEW YORK ACADEMY OF SCIENCES.

The Academy has learned with sorrow of the death of Mr. John H. Redfield, at his home, in Philadelphia, on February 27th, 1895.

Mr. Redfield was one of the earliest members of the Lyceum of Natural History, having been elected in 1836. During his years of residence in New York he was most active in furthering the work of the Lyceum, a frequent contributor to its proceedings and the author of several conchological papers which were printed in its Annals. In connexion with his father, Mr. W. C. Redfield, he published, in Vol. IV. of the Annals, the first description of fossil fishes from the Mesozoic rocks of America, proposing the name of the genus *Catopterus* and its type species *C. gracilis*, besides some others, for specimens from the Triassic beds at Durham, Conn. He was thus the pioneer in this important branch in American palaeontology. He held the office of Recording Secretary of the Lyceum in the years 1887–8, and of Corresponding Secretary for the entire period from 1839 to 1860. After his removal to Philadelphia he did not lose his interest in the Lyceum, but continued his relations with it as a Corresponding Member, not only through the whole period of its existence under the old name, but also when the organization was changed and enlarged into the Academy and down to the time of his death. When the memorial volume was published, in 1887, Mr. Redfield furnished a large amount of most valuable data and reminiscences, which are embodied and acknowledged at many points in the book.

Although personally known to but few of our present members, many have known of his great work in connexion with the Academy of Natural Sciences in Philadelphia, and by reason of this, and his early prominence in our Society, he has had our profound respect and grateful esteem. It is, therefore,

Resolved, That it is the sense of the Academy that in the death of Mr. John H. Redfield, American science has lost a critical and enthusiastic student, a liberal patron and a devoted friend; and the Academy a co-laborer who greatly aided in its early period of organization, as an officer and a scientific investigator, and who was almost the last to connect its present membership with the generation of its founders and pioneers.

FROM THE TORREY BOTANICAL CLUB.

Mr. John H. Redfield, a highly esteemed active member of the Club since the time of its organization, the last but one of its original incorporators, a frequent contributor to our publications, the Conservator of the Botanical Section of the Philadelphia Academy of Natural Sciences, and well-known to the botanical world as an author and editor, died at his home in Philadelphia, February 27th, 1895. Therefore it is

Resolved, That the following record be made in our minutes: As a scientific co-laborer, we found in Mr. Redfield an enthusiastic lover of nature and of knowledge for its own sake, an energetic and persistent worker in the field and in the closet to the very end of a long and memorable life, and a gentleman of ripe culture and pleasant manners, always generous and helpful to others, and, though firm in his convictions as to what was right, ever modest and courteous in the expression of them.

Resolved, That in his death we mourn the loss of a valued associate and an ardent and faithful friend.

Resolved, That this action be printed in our proceedings and a copy thereof transmitted to the family of the deceased.

List of Scientific Papers and Notices by John H. Redfield.

1. Fossil Fishes of Connecticut and Massachusetts, with a Notice of an undescribed Genus. Ann. N. Y. Lyc. Nat. Hist. **4**: 35. *pl. 2.* 1837.

2. Descriptions of some new Species of Shells. Ann. N. Y. Lyc. Nat. Hist. **4**: 163. *pl. 2.* 1846.

3. On the distinctive Characters of *Cypraea reticulata* of Martyn and *Cypraea histrio* of Menschen. Ann. N. Y. Lyc. Nat. Hist. **4**: 417. *pl. 1.* 1847.

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A fossil marine Diatomaceous Deposit at St. Augustine, Florida.

BY CHARLES S. BOYER.

In 1886 an artesian well was sunk at the Ponce de Leon Hotel, at St. Augustine, Florida. Samples of earth from different depths were sent to Mr. Lewis Woolman, who proposes to publish the results of his investigations into the geological character of the different strata. A layer of bluish clay at a depth of between 85 and 135 feet was found to contain diatoms, spicules, foraminifera and a few polycistinae. Unfortunately, the material was very small in amount, and the diatoms occurred in but two layers at the depths of 90 and 120 feet, so that the list furnished below, although exhaustive of the material obtained, appears to but indicate the existence of a richer bed which, it is hoped, may be brought to light by another well-boring or the discovery of some outcrop.

It may be briefly stated, according to Mr. Woolman's conclusions, that the diatomaceous clay bed immediately overlies an Eocene deposit and is beneath a Pleistocene. As will be noticed, the diatoms correspond, to a great extent, to those of the great Miocene beds of the Atlantic coast, such as the Richmond, Nottingham and Atlantic City deposits; the presence of one form, at least, if not two, appears to indicate a correspondence with the Barbadoes deposit, which is now claimed to be Pliocene, while other forms are still extant. It is, therefore, difficult to determine to what period the Florida deposit belongs.

The following are the forms:—

Actinocyclus Ehrenbergii Ralfs, several varities.

A. ellipticus Grun., rare.

A. interpunctatus Ralfs.

A. Ralfsii (Wm. Sm.) Ralfs.

A. subtilis (Greg.) Ralfs, var.

Actinoptychus Grundleri A. S.

A. undulatus Ralfs, several vars.

A. vulgaris Schum., several vars.

Aulacodiscus Crux Ehr., rare.

A. mammosus (var. *extans*?) Grev., very rare. Diam. 0. 152 mm. Surface, central portion, flat to about one-half of the radius, outer edge distinct but somwhat turned inward at the inflations, giving a slightly quadrangular outline. Central space in one specimen round, in the other irregular. Width of bullae *about one-fourth the radius.* In Greville's figure the width appears to be about one-half. The processes are also smaller in the Florida form. Not being able to secure a specimen of Greville's species for comparison, I am unable to determine the differences further. Mr. Adre. Le Tourneur, of Paris, from an examination of a photopraph sent him, thinks it may be the variety *extans* (Grev.) Rattr. This beautiful form is quite rare, only two nearly perfect valves and three fragments having been noticed. It has not been found, heretofore, we believe, in any other of the continental deposits, and its presence appears to link the Florida diatoms with those of Barbadoes.

A. Molleri Grun.

A. Rogersii (Bail.) A. S., common at 90 ft.

The deposit presents all the forms figured by Schmidt, with a number of intermediate variations.

Biddulphia Tuomeyi (Bail.) Roper. Several variations of this form approach *B. elegantula* Grev., and others are much smaller than the type.

Coscinodiscus apiculatus Ehr.

C. marginatus Ehr.

C. emphalanthus Ehr.

C. perforatus Ehr.

C. radiatus Ehr.

C. robustus Grev.

The forms of *Coscinodisci* noticed furnish an interesting study of variations, especially in those which approach *apiculatus* and *marginatus*.

Craspedodiscus coscinodiscus Ehr., 120 ft.

Eupodiscus radiatus Bail. A form with five ocelli occurs rarely at the depth of 90 ft.

Goniothecum odontella Ehr., 90 ft.

Grammatophora maxima Grun. var.? rare.

Hyalodiscus laevis Ehr.

H. subtilis Bail. The markings in the greater number of specimens examined are much coarser than in the type form. In some valves which present a greenish color when dry, numerous spines are seen at regular intervals, and the zone between umbilicus and margin resembles that of *H. maximus*, P. Petit (Diatomee's de l'le Campbell, *pl. 4. fig. 7*). Other forms without spines correspond closely to the var. *Japonica* of Castracane (Rep. on Diat. coll. by H. M. S. Challenger, *pl. 18. fig. 4*).

Melosira sulcata (Ehr.) K., abundant.

Navicula Lyra Ehr., very rare, 90 ft.

N. praetexta Ehr., very rare, 90 ft.

Pleurosigma affine, var. *fossilis* Grun.

Podosira Montagnei Kütz.? , very rare, 90 ft. This form is doubtful as the rim is wider and the general appearance more robust than in any of the figures published.

Rhaphoneis gemmifera Ehr.

Rhizosolenia sp. ?

Stephanogonia (*Mastogonia*) *actinoptychus* Ehr., rare.

Stephanopyxis appendiculata Ehr.

S. corona (Ehr.) Grun.

S. turris (Grev.) Ralfs, rare.

Stictodiscus Trunanii Witt. ?, very rare, 90 ft. This form differs from that figured by Truan and Witt. (Die Diat. der Polycyst. von Jeremie in Hayti, *pl. 4. figs. 23 & 24*), inasmuch as the rim is less definite and the outline slightly irregular. Only one imperfect specimen was found. It appears to form another link between the continental and insular deposits.

Triceratium condecorum Ehr., rare, 90 ft.

T. Kainii E. A. Schultze, rare, 120 ft.

T. semicirculare Brightw.—*Euoaia Brightwellii* Ralfs.

T. spinosum (Ehr.) Bail.

New Species of Parasitic Fungi.

BY S. M. TRACY AND F. S. EARLE.

[Type specimens in the herbaria of the authors, of the U. S. Department of Agriculture, of Rutgers, Harvard and Columbia Colleges.]

PUCCINIA NOTABILIS n. sp. III. Amphigenous; sori black, confluent, forming small hemispherical or irregular masses on the bracts and petioles or involving the larger stems, forming fusiform black gall-like swellings two or three times their diameter and 3–4 cm. in length; teleutospores uniformly oval and obtusely rounded, slightly constricted, epispore smooth, thickened at the apex, 55–60 by 30–33 μ; pedicel hyaline or slightly tinted, very long and flexuous, 225–275 μ.

On Arrow-wood (*Pluchea borealis ?*) Rio Penasco, New Mexico, January, 1895.

PUCCINIA PASPALI n. sp. II. Usually hypophyllous, sometimes amphigenous; sori linear, sometimes confluent, dark brown; uredospores globose or obovate, very abundantly and sharply echinulate, brown, 24 by 25–30 μ. III. Sori linear, darker than te uredo sori, usually on the leaf sheaths; teleutospores irregular, 35 by 27 to 30 by 35 μ, usually oval, much constricted, with the slender nearly hyaline pedicel attached obliquely to one side of the lower end, often orbicular with the septum vertical and the pedicel attached either to the septum or near it, and the epispore of both cells distinctly thickened at the apex.

On *Paspalum virgatum*, New Orleans, La., November, 1894.

USTILAGO CRUS-GALLI n. sp. Involving the panicles and upper nodes, making the panicles abortive and forming pustules sometimes 1 cm. in diameter at the nodes; spore masses powdery, black, at first covered by a gray membrane; spores oval or subglobose, fuscous, sharply echinulate, 9–10 by 11–13 μ.

On *Panicum Crus-galli*, Salt Lake City, Utah, August, 1887.

This seems to approach *U. Maydis*, but the spores, though equally echinulate, are uniformly larger and more elongated.

USTILAGO TONGLINENSIS n. sp. Spore masses infesting the ovaries and causing the glumes to open widely at maturity, black; spores globose, dark brown, sharply and thickly echinulate, 9–11 μ.

On *Ischaemum ciliare*, Tonglin, Singapore. H. N. Ridley.

USTILAGO ORNATA n. sp. Infesting the ovaries. Spore masses black, pulverulent, 20–30 mm. in diameter; spores subglobose, very thickly beset with strong and prominent echinulations which give the spore a burr-like appearance, 12–12 by 15 μ. Panicles bearing affected ovaries always remain partially enclosed within the sheath of the upper leaf.

On *Leptochloa mucronata*, Starkville, Miss., November, 1894.

USTILAGO PERTUSA n. sp. Infesting the ovaries; spore masses hard and compact, black, finally pulvinate; spores small, globose, epispore covered with prominent irregular verrucose projections, 5–7 μ.

On *Setaria macrochaeta*, Queensland. F. M. Bailey, 1890.

USTILAGO PUSTULATA n. sp. Infesting the ovaries, or forming rounded bullate swellings which often surround the entire stem and branches of the panicle, or form irregular distortions on the leaves and sheaths; spore masses dark brown, long covered by a stramineous membrane which is a distortion of the tissues of the host, 25–75 mm. in diameter; spores dark brown or fuscous, subglobose or oval, cell-wall very thin, slightly echinulate, 7.5 to 9 μ., or 7 by 9 μ.

On *Panicum proliferum*, Starkville, Miss., October, 1894.

DIMEROSPORIUM MAGNOLIAE n. sp. Epiphyllous, on small indefinite areas; mycelium of dark brown irregular branching and septate hyphae; conidia clavate, dark colored, 4–5-septate, 7–8 by 45–55 μ; perithecia depressed-hemispherical, black, usually in clusters of 5 to 10, astomous, 50–100 μ; asci numerous, broadly oval or obovate, 8-spored, 35–40 by 45–50 μ, paraphysate; paraphyses thread-like, colored towards the tips; sporidia biseriate, at first hyaline, dark fuliginous when mature, obovate, 1-septate, constricted, 9-10 by 20-23 μ.

On living leaves of *Magnolia Virginiana*, Ocean Springs, Miss., May, 1894.

Asteridium Illicii n. sp. Hypophyllous; mycelium none; perithecia black, scattered, orbicular, aplanate, membranaceous, cellular, not radiant, fragile, wrinkled, 200–400 μ; asci numerous, suborbicular, 8-spored, 30–40 μ; sporidia subpyriform, often curved, granular, colorless, at first uniseptate, becoming 3-septate at maturity.

On living leaves of *Illicium Floridanum*, Ocean Springs and Biloxi, Miss., March, 1889.

Laestadia Illicicola n. sp. Amphigenous, occupying large irregular brownish subarid definitely limited areas, usually involving the apical half of the leaf; perithecia very numerous, scattered, erumpent, more abundant on the upper surface, black, membranaceous, suborbicular or lenticular, obscurely ostiolate, finally collapsing; asci without paraphyses, clavate, stipitate, thickened at the apex, 40–50 by 10–12 μ; sporidia ovoid or fusiform, continuous, hyaline, granular, about 15 by 5 μ.

On living leaves of *Illicium Floridanum*, Ocean Springs, Miss., March, 1892.

Sphaerella Andromedae n. sp. Hypophyllous; spots none; perithecia abundant, scattered, often covering the entire lower surface of the leaf, black, erumpent, ostiolate, at length collapsing; asci obovate, somewhat thickened at the apex; sporidia oval, hyaline, uniseptate, cells about equal; 7–8 by 2.5–3 μ.

On living leaves of *Pieris nitida*, Ocean Springs, Miss., March, 1888.

Lembosia angustiformis n. sp. Epiphyllous, on raised brown irregularly stellate blisters; mycelium scant; perithecia black, long and narrow, often flexuous, seldom branched, 60–80 by 175–300 μ; subiculum reduced to a few short flexuous slightly fuscous branching threads; asci broadly oval, about 15 by 18 μ; sporidia obovate, somewhat unequally uniseptate, constricted, at first hyaline, becoming light fuliginous, 8–10 by 4–5 μ.

On *Ilex coriacea*, Ocean Springs, Miss., May, 1894; Biloxi, Miss., July, 1894.

This differs widely from the following in gross appearance on the leaf, in the narrower perithecia, less conspicuous subiculum and smaller asci and sporidia.

Lembosia prinoides n. sp. Epiphyllous, on orbicular pallid spots; mycelium scant, brown; perithecia scattered, black, subcarbonaceous, fimbriate-margined, elliptical, subacute, often forking, 200–350 by 120–150 μ; subiculum of dark brown irregular nodular usually continuous and branching brittle threads; asci ovate, 8-spored, 30–35 by 15–18 μ; sporidia elliptical, unequally uniseptate, somewhat constricted, subhyaline, becoming fuliginous, 10–15 by 4–5 μ.

On *Ilex coriacea*, Biloxi, Miss., July, 1893.

LEMBOSIA ILLICIICOLA n. sp. Epiphyllous, on large light brown orbicular or irregular areas; perithecia numerous, superficial, carbonaceous, usually linear and strict, occasionally triangularly stellate, 100 by 300–400 μ; subiculum of light brown flexuous transparent continuous variously branching and anastomosing threads; asci very numerous, oval or ovate, 8-spored, 25–30 by 12 μ; sporidia oval, uniseptate, slightly constricted, ends obtusely rounded, hyaline, at length slightly colored, 8–10 by by 3–4 μ.

On *Illicium Floridanum* with *Asteridium Illicii*, Ocean Springs, Miss., March, 1889.

VERMICULARIA STACHYDIS n. sp. Perithecia scattered, subsuperficial; setae somewhat floccose and nodular, septate, olivaceous, paler towards the tips, which are obtuse and slightly enlarged; conidia falcate, attenuate at each end but without evident basidia, guttate, at length faintly 4–5-septate, 35–40 by 3–4 μ.

On dead stems of *Stachys affinis*, Starkville, Miss., October, 1893.

This differs from other described species in the larger, at length several-septate conidia, and the weak rather light colored setae with swollen tips.

DIPLODIA MINUTA n. sp. Scattered over indeterminate whitened areas; perithecia erumpent, small, 90–120 μ, membranaceous, smooth, ostiolate; sporules minute, oval, uniseptate, not constricted, light yellow, 6–8 by 3–4 μ.

On living stems of *Tecoma radicans*, with *Pestalozzia breviaristata*, Starkville, Miss., March, 1895.

DIPLODIA SASSAFRAS n. sp. Perithecia very numerous over large areas, black, hemispherical, erumpent, finally opening by an irregular fissure; sporules numerous, ovate, fuscous or nearly black, with a very distinct hyaline septum near the smaller end, 13–14 by 5–6 μ.

On living twigs and branches of *Sassafras*, Starkville, Miss., April, 1894.

HENDERSONIA TAPHRINICOLA n. sp. Epiphyllous, on white bordered spots. Perithecia scattered, black, erumpent, at length collapsing; conidia truncate, cylindrical, fuliginous, 2-septate, constricted at the septa, 12–14 by 4–5 μ.

On old whitened blisters of *Taphrina* on *Quercus Virginiana*, Ocean Springs, Miss., February, 1887.

PESTALOZZIA CLIFTONIAE n. sp. Epiphyllous, on orbicular arid brown-bordered spots. Acervuli scattered, bursting through the dried epidermis; conidia obovate, sometimes curved, 4-septate, septa often oblique, three medial cells fuliginous, the upper two dark and opaque, the lower one paler, basal cell colorless, small, short, acute, abruptly contracted to the short stipe; apical cell reduced to a short colorless apiculus bearing the three widely divirgent setae, 16–18 by 8 μ; setae 12–14 μ.

On living leaves of *Cliftonia ligustrina*, Ocean Springs, Miss., November, 1893.

PESTALOZZIA BREVIARISTATA n. sp. Acervuli scattered over indefinite whitened areas, black, at length collapsing; conidia curved, elliptical, 5-septate, apical and basal cells colorless, medial cells fuscous, septa often diagonal, 25–27 by 7–8 μ; stipe hyaline, half the length of the conidium, somewhat swollen at the base, often deciduous; arista single, strongly oblique, thickened, scarcely one-fourth the length of the conidium.

On living stems of *Tecoma radicans* with *Diplodia minuta*, Starkville, Miss., March, 1895.

SCOLECOTRICHUM PUNCTULATUM n. sp. Amphigenous; spots indefinite; hyphae in small caespitose clusters, irregularly flexuous and nodular, olivaceous, 2–3-septate, 60–70 by 5–6 μ; conidia oval or oblong, ends obtusely rounded, fuscous, epispore distinctl granulose or punctulate, typically uniseptate but often continuous, and occasionally 3-septate, 15–20 by 6–8 μ.

On *Iris pabularia*, Starkville, Miss., January, 1894.

CERCOSPORA FLEXUOSA n. sp. Forming large indefinite effused patches on the under side of the leaf. Hyphae ferruginous, irregularly flexuous throughout, sometimes branched, many-septate, denticulate, 75–150 by 4–5 μ; conidia obclavate, fuscous, 2–6, 3–4-septate, not constricted, 20–30 by 4–5 μ.

On leaves of *Diospyros Virginiana*, Biloxi, Miss., July, 1892, and Ocean Springs, Miss., October, 1889.

This differs from *C. Diospyri* (Thum.) Cke. in its septate hyphae and much longer spores, and from other *Cercosporas* reported on the same host in the absence of definite spots.

CERCOSPORA GRAMINICOLA n. sp. Spots none; amphigenous and most abundant on the midvein; hyphae caespitose, straight or somewhat flexuous, fuscous, 2–3-septate, 75–100 by 4–5 μ; conidia clavate, continuous when young but finally becoming 1–3-septate, fuscous, 35–40 by 7.5–10 μ.

On languishing leaves of *Phleum pratense*, Starkville, Miss., November, 1894.

CERCOSPORA HIBISCI n. sp. Hypophyllous, on large indeterminate areas; hyphae fuliginous, clustered, somewhat irregular, once or twice septate near the base, 25–40 μ; conidia obclavate, somewhat curved, hyaline, guttulate, at length faintly 3–5-septate, 40–60 by 3–4 μ.

On living leaves of *Hibiscus esculentus*, New Orleans, La., November, 1894.

CERCOSPORA MARITIMA n. sp. Amphigenous; not forming definite spots, but densely effused over considerable dark-colored areas; hyphae fasciculate, mostly straight, olive brown, 5–6-septate, often swollen at the septa, 40–100 by 4–6 μ: conidia paler, elongated, straight or slightly curved, mostly uniseptate, the upper cell shorter and broader than the lower, 50–60 by 5–7 μ.

On *Croton maritimum*, Horn Island, Miss., March, 1892.

CERCOSPORA MISSISSIPPIENSIS n. sp. Amphigenous, but more abundant on the under side of the leaf. Spots small, brownish, irregular, usually bounded by the veins, surrounded by an irregular raised and darker border having a pallid outer margin; hyphae divergent, irregularly floccose, nodular, usually uniseptate above the somewhat bulbous base, 60–70 by 5 μ; conidia fuscous, narrowly clavate, tapering from the rather obtuse apex to the attenuated filiform nearly hyaline base, 4–8 or more septate, 75–150 by 4–5 μ.

On *Smilax glauca*, and *S. rotundifolia*, Starkville, Miss., November, 1893.

TETRAPLOA DIVERGENS n. sp. In black irregularly linear masses; conidia broadly oval, dark-fuliginous, 12-14 by 8-9 μ, quarternately divided, each division usually 2-septate, and terminated by an obtuse semi-transparent continuous divergent horn-like projection, 4-5 μ in length.

On living or languishing leaves of *Panicum agrostidiforme*, Starkville, Miss., October, 1894.

The Systematic Botany of North America.

The Board of Editors of the "Systematic Botany of North America" announce the following arrangements for the monographing of groups thus far decided on. Other assignments will be reported as made. It is requested that collectors communicate material for study to the monographers, even of the commoner and well-known species, so that the geographical distribution may be presented as accurately as possible.

MYXOMYCETES: Mr. O. F. Cook, Huntington, N. Y. (at present abroad).
SCHIZOMYCETES: Prof. H. L. Russell, University of Wisconsin, Madison, Wis.
CHLOROPHYCEAE: In charge of Prof. Geo. L. Atkinson, Cornell University.
PHYCOMYCETES: Prof. Byron D. Halsted, Rutgers College, New Brunswick, N. J.
SACCHAROMYCETES: Dr. J. Christian Bay, State Board of Health, Des Moines, Iowa.
TAPHRINEAE: Prof. Atkinson.
HELVELLINEAE: Prof. Lucien M. Underwood, Greencastle, Ind.
PEZIZINEAE, PHACIDINEAE: Mr. Ellis J. Durand, Cornell University.
FUNGI IMPERFECTI: Prof. Byron D. Halsted, Rutgers College, and Mr. J. B. Ellis, Newfield, N. J.
USTILAGINEAE: Prof. Halsted.
UREDINEAE: Prof. J. C. Arthur, La Fayette, Ind.
POLYPORINEAE: Prof. Underwood.
BOLETINEAE, AGARICINEAE: Prof. Chas. H. Peck, State Museum, Albany, N. Y.
GASTEROMYCETES: Mr. A. P. Morgan, Preston, Ohio.
HEPATICAE: Prof. Underwood.
MUSCI—*Acrocarpi*: Mrs. N. L. Britton, Columbia College, New York City; *Pleurocarpi*: Prof. C. R. Barnes, University of Wisconsin; *Sphagnaceae*: Mr. John K. Small, Columbia College, New York City.
PTERIDOPHYTA: Prof. Underwood.
TYPHACEAE, SPARGANIACEAE, NAIDACEAE, JUNCAGINACEAE: Manuscript of the late Dr. Thos. Morong.
ALISMACEAE: Mr. Jared G. Smith, U. S. Department of Agriculture.
HYDROCHARITACEAE: Manuscript of Dr. Morong.
GRAMINEAE: In charge of Prof. F. Lamson-Scribner, U. S. Department of Agriculture.
CYPERACEAE: Prof. L. H. Bailey, Cornell University, and Prof. N. L. Britton, Columbia College.
ARACEAE: Manuscript of Dr. Morong.
LEMNACEAE: Mr. E. P. Sheldon, University of Minnesota, Minneapolis, Minn.
ERIOCAULACEAE: Manuscript of Dr. Morong.
COMMELINACEAE: Mr. J. N. Rose, U. S. Department of Agriculture.
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DIOSCOREACEAE: Prof. A. S. Hitchcock, Kansas Agricultural College, Manhattan, Kansas.

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JUGLANDACEAE: Prof. N. L. Britton.

MYRICACEAE: Prof. Britton.

LEITNERIACEAE: Prof. Wm. Trelease, Missouri Botanical Garden.

SALICACEAE: Mr. M. S. Bebb, Rockford, Ill. (*Salix*).

BETULACEAE, FAGACEAE, ULMACEAE, MORACEAE; Mr. Geo. B. Sudworth, U. S. Department of Agriculture.

URTICACEAE, LORANTHACEAE, SANTALACEAE, OLACACEAE, ARISTOLOCHIACEAE: Mr. T. H. Kearney, Jr.

POLYGONACEAE: Mr. John K. Small, Columbia College.

CHENOPODIACEAE: Mr. Willis L. Jepson, University of California, Berkeley, Cal.

AMARANTHACEAE: Messrs. E. B. Uline and W. L. Bray, Lake Forest University, Lake Forest, Ill.

PHYTOLACCACEAE: Prof. A. S. Hitchcock, Kansas Agricultural College.

PORTULACACEAE: Mr. Jepson.

NYMPHEACEAE: Prof. Chas. A. Davis, Alma College, Alma, Mich.

RANUNCULACEAE: Prof. N. L. Britton.

MENISPERMACEAE: Prof. A. S. Hitchcock.

CALYCANTHACEAE: Mr. T. H. Kearney, Jr.

GERANIACEAE, OXALIDACEAE, LINACEAE: Prof. Wm. Trelease.

MALPIGHIACEAE, ZYGOPHYLLACEAE, RUTACEAE: Miss Anna M. Vail, Columbia College, New York City.

SIMARUBACEAE, BURSERACEAE, MELIACEAE: Mr. Geo. B. Sudworth.

POLYGALACEAE: Dr. Wm. E. Wheelock, Columbia College.

CALLITRICHACEAE: Studies of Dr. Morong.

MALVACEAE: Mr. J. Burtt Davy, University of California.

GUTTIFERAE, HYPERICACEAE: President John M. Coulter, Lake Forest University.

CISTACEAE: Prof. Britton.

EMPETRACEAE: Prof. Hitchcock.

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RHAMNACEAE: Mr. Willis L. Jepson.

VITACEAE: Prof. L. H. Bailey.

LOASACEAE: Dr Wm. E. Wheelock.

CACTACEAE: President Coulter.

THYMELEACEAE, ELEAGNACEAE: Prof. Hitchcock.

HALORACEAE: Studies of Dr. Morong.

ARALIACEAE: Prof. Hitchcock.

UMBELLIFERAE; Pres. Coulter and Mr. Rose.

CORNACEAE: Pres. Coulter.

CLETHRACEAE, PYROLACEAE, MONOTROPACEAE, LENNOACEAE, ERICACEAE, DIAPENSIACEAE: Mr. F. V. Coville, U. S. Department of Agriculture.

MYRSINACEAE, PRIMULACEAE, PLUMBAGINACEAE, SAPOTACEAE, EBENACEAE, SYMPLOCACEAE, STYRACACEAE, OLEACEAE, LOGANIACEAE: Mr. John K. Small, Columbia College.

GENTIANACEAE: Mr. Chas. L. Pollard, U. S. Department of Agriculture.

BORAGINACEAE: Prof. Edward L. Greene, University of California.

VERBENACEAE: Prof. A. S. Hitchcock.

SOLANACEAE, SCROPULARIACEAE: President Coulter.

CICHORIACEAE, COMPOSITAE: Prof. Greene (*Aster* and *Solidago* by Prof. Thos. C. Porter, Lafayette College, Easton, Penn.).

Botanical Notes.

A Redfield Memorial Herbarium Fund. It has been decided that no better monument to the memory of John H. Redfield could be erected than to arrange for completing and caring for the work he loved, and to which he gave freely so many years of his life—namely, the Herbarium of the Academy of Natural Sciences. Mainly through his disinterested labors, it stands to-day scarcely second to any in the United States, containing, besides many unnamed, over thirty-five thousand named species of flowering plants and ferns, the half of which have been verified and fastened down.

No one can probably be found to give the years of time he so freely gave. In order to carry on the work, and add to the collection, as exploring expeditions afford the opportunity, it has been proposed to establish a fund for its maintainance.

Mr. Redfield's will provides that his herbarium, minerals, shells and scientific works shall be sold to help the Herbarium—thus furnishing a nucleus for the proposed fund. It is in mind to raise $20,000, but the interest of any sum that may be contributed can at once be made available. Statements will be furnished from time to time to contributors, keeping them informed of the progress of the contributions. Checks may be made payable to the order of Thomas Meehan, Director, or Stewardson Brown, Treasurer, and mailed to either at the Academy of Natural Sciences, Nineteenth and Race streets, Philadelphia.

Announcement of the next Meeting of the American Microscopical Society. The next meeting of the American Microscopical Society will be held at Cornell University, in Ithaca, N. Y., August 21, 22 and 23, 1895, that is the week previous to the meeting of the

American Association for the Advancement of Science, which is to be held in Springfield, Mass.

The unsurpased beauty of the location of the University, and the richness of both its terrestrial and aquatic fauna and flora, make this an ideal place for holding the meeting. It is equally attractive to the student of natural history and to those who love beautiful scenery.

The University buildings, which will be at the disposal of the Society, are especially adapted for the formal presentation of papers, blackboard illustrations, hanging of diagrams, etc., as well as for any demonstration that authors may desire to make. The armory is very conveniently located, both for the University and for the city, and a soiree there can hardly fail to be a great success.

Besides the attraction of papers and demonstrations by members, nearly all the opticians have expressed not only a willingness but a desire to be present and make an exhibit of their microscopes and microscopical apparatus, thereby affording the members an opportunity to see all the new and standard apparatus.

A special feature of the coming meeting will be the setting apart of one or more sessions for the reading of papers on methods and the demonstration of special or new methods. The chairman of the local committee, Professor W. W. Rowlee, or the President, will be glad to receive requests from those who desire to have some specially difficult method or structure elucidated, and an effort will be made to get some member particularly expert in such subject to demonstrate it before the Society.

Proceedings of the Club.

Tuesday Evening, March 12th, 1895.

Vice-President Lighthipe in the Chair and 24 persons present.

The following were elected active members: Mr. Claude Crittenden, Mrs. Wm. Starr Dana, Mr. Eugene H. Van Nest, Mr. James P. Gardner, Mr. S. Cook.

The Committee appointed to draw up resolutions on the death of Dr. J. Bernard Brinton presented a report which was accepted, and a copy of it placed on file.

The Instruction Committee reported progress, and submitted the prospectus of the summer class for 1895. The report was accepted.

The Chair appointed the following Field Committee for 1895: Chairman, Mr. Small; Mrs. Britton; Mr. Tyler; Mr. Van Sickle; Dr. Rusby.

The announced papers of the evening were then presented as follows:

George V. Nash, "Remarks on some new and little-known Plants of Central Florida." Illlustrated by specimens. (Published in this issue of the BULLETIN.)

Elizabeth G. Britton, "Some Notes on the Genus *Mnium*." (To be published in a subsequent issue of the BULLETIN.)

A. Cogniaux, "Descriptions of new Melastomaceae from Bolivia," communicated by Dr. Rusby. (To be published in a subsequent issue of the BULLETIN.)

WEDNESDAY EVENING, MARCH 27TH, 1895.

Dr. Britton in the Chair and 34 persons present.

Mr. Eugene Smith, Miss Bliss, Miss Augusta Bliss and Miss Edith Parish were elected active members.

Dr. Britton announced the death of Mr. John H. Redfield, and remarked upon his life and labors. The Secretary also spoke upon the subject. Mr. Small moved that the Chair appoint a committee of three to draft suitable resolutions. Upon the adoption of the motion, a committee was appointed, consisting of Mr. Small and Professors Porter and Rusby.

Dr. Albert Schneider read his announced paper on "The Biological Status of the Lichens," maintaining that they are entitled to recognition as an independent group, and not to be classed as a division of either Algae or Fungi. It will be published in a subsequent issue of the BULLETIN.

Index to recent Literature relating to American Botany.*

Alwood, W. B. Ripe Rot or Bitter Rot of Apples. Bull. Va. Agric. & Mech. Coll. (II.) **3**: 59–82. *pl. 2.* My. 1894.

Description of *Gloeosporium fructigenum* Berk. with a bibliography.

Bailey, L. H. Experimental Evolution amongst Plants. Am. Nat. **29**: 318–325. Ap. 1895.

Argument that species have repeatedly been evolved by cultivation.

Bastin, E. S. Structure of *Veratrum viride.* Am Journ. Pharm. **67**: 196–203. *f. 1–6.* Ap. 1895.

Brandegee, T. S. *Mimulus Clevelandii.* Gard. & For. **8**: 134. *f. 20.* 3 Ap. 1895.

A new species from Southern California.

Britton, N. L. Publication by Signatures. Erythea, **3**: 50–52. 1 Mr. 1895.

With notes on the subject by E. L. Greene.

Clinton, G. P. Relationship of *Caeoma nitens* and *Puccinia Peckiana.* Bot. Gaz. **20**: 116, 117. 16 Mr. 1895.

Cogniaux, A. Orchidaceae.—II. Flora Bras. **117**: 158–318. *pl. 35–75.* 15 Ja. 1895.

Durand, E. J. Sporangial Trichomes in certain Ferns. Bull. Torr. Bot. Club, **21**: 408. 1894.

Durand, E. J. The Development of *Olpidium*, one of the Chytridiaceae. Bull. Torr. Bot. Club, **21**: 410. 1894.

Describes briefly the development of *Olpidium entophytum*, A. Braun, in the cells of *Spirogyra.*

Gibson, W. H. Welcomes of the Flowers. Harper's Mag. **1894**: 551–556. *figs.* Mr. 1894.

Discusses relation of insects to flowers, wild and cultivated.

Golden, K. E. Movements of Gases in Rhizomes. Proc. Am. Assoc. Adv. Sci. **43**: [reprint, pp. 10]. 1894.

Graves, J. A., Chairman. The Pteridophyta of North America, north of Mexico. Linnaean Fern Bull. 9: pp. 23. Binghampton, 1895.

A numbered list of species and varieties.

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* It is requested that omissions from this list be communicated to the editors.

Greene, E. L. *Ceanothus leucodermis*, n. sp. Kew Bulletin, 97: 15. Ja. 1895.

Description of a new species from California, found in Kew Herbarium; with discussion of *C. divaricatus.*

Greene, E. L. Corrections in Nomenclature—VI. Erythea, **3**: 36. 1 F. 1895.

Greene, E. L. Novitates occidentales.—XI. Erythea, **3**: 44–49. 1 Mr. 1895.

New species of *Ranunculus, Roripa, Tissa, Trifolium, Raillardella, Crepis, Allocarya, Collinsia* and *Habenaria.*

Greene, E. L. Novitates occidentales.—X. Erythea, **3**: 17–24. 1 F. 1895.

New species in *Vicia, Lupinus, Trifolium, Thermopsis, Ranunculus, Erigeron, Pyrrocoma, Senecio, Agoseris, Phacelia* and *Linanthus.*

Greene, E. L. Observations on the Compositae.—VIII. Erythea, **3**: 6–15. 2 Jl. 1895.

Discusses *Aplopappus* and *Chrysoma* with several transfers of species. Establishes the genera *Stephanodoria, Petradoria* and *Osbertia* for previously described species.

Greene, E. L. Some Species of *Dodecatheon.* Erythea, **3**: 37–40. 1 Mr. 1895.

Describes *D. radicatum, D. alpinum, D. tetrandrum* Suksdorf and *D. conjugens.*

Hansen, G. Flora of the *Sequoia* Region collected in the Counties of Amador, Calaveras and Alpine, State of California. Pamph. pp. 14. 1 Ja. 1895.

A list of several hundred species.

Hasse, H. E. Lichens of the Vicinity of Los Angeles.—I. Erythea, **3**: 41–44. 1 Mr. 1895.

Havard, V. Food Plants of the North American Indians. Bull. Torr. Bot. Club, **22**: 98–123. 27 Mr. 1895.

Hooker, J. D. *Schinus dependens.* Curt. Bot. Mag. **51**: *pl. 7406.* Mr. 1895.

Native of South America.

Hooker, J. D. *Weldenia candida.* Curt. Bot. Mag. **51**: *pl. 7405.* Mr. 1895.

Native of Mexico and Guatemala.

Kelsey, F. D. Some Field Notes. Bot. Gaz. **20**: 117–118. 16 Mr. 1895.

Kenyon, F. C. In the Region of the new Fossil, *Daemonelix.* Am. Nat. **29**: 213–227. *pl. 11. figs.* Mr. 1895.

From the mode of growth the analogies of the organism are thought to be "among some of the lower plants and grasses."

Knoblauch, E. Die Nomenclature der Gattungen und Arten. Bot. Centralb. **61**: 1–6. Ja. 1895.

Lagerheim, G. de. See Patouillard, W.

Lemmon, J. G. A new *Calochortus*. Erythea, **3**: 49–50. 1 Mr. 1895.

C. collinus from Central California.

Linsbauer, L. Beiträge zur Vergleichenden Anatomie der Caprifoliaceen. Verh. Zool. Bot. Gesel. Wien, **45**: 43–68. *pl. 6.* 1895.

Meehan, T. *Iris cuprea.* Meehan's Month. **5**: 61–62. *pl. 4.* Ap. 1895.

Miller, A. W., Beringer, G. M., and **Crawford, J.,** Committee. Biographical Sketch of Dr. J. Bernard Brinton. Bull. Torr. Bot. Club, **22**: 93–97. *Portrait.* 27 Mr. 1895.

Müller, J. Graphideae Eckfeldtianae in Louisiana et Florida lectae, additis observationibus in Graphideas Calkinsianas ejusdem regionis. Bull. Herb. Boiss. **3**: 41–50. F. 1895.

Pammel, L. H. Botany of the Russian Thistle. Bull. Iowa Agric. Coll. Exper. Sta. *26*: 8–25. *pl. 8.* 1894.

Pammel, L. H. Further Notes on *Cladosporium carpophilum*. Proc. Iowa Acad. Sci. **1**: 92, 93. 1894.

Pammel, L. H. Powdery Mildew of the Apple. Proc. Iowa Acad. Sci. **1**: 92. 1894.

Patouillard, W. et **Lagerheim, G. de.** Champignons de l'Equateur. Bull. Herb. Boiss. **3**: 53–74. *pl. 2.* F. 1895.

Descriptions of fifty new species.

Robertson, C. Flowers and Insects.—XIII. Bot. Gaz. **20**: 104–110. 16 Mr. 1895.

Robertson, C. The Philosophy of Flower Seasons and the Phaenological Relations of the Entomophilons Flora and the Anthophilous Insect Fauna. Am. Nat. **29**: 97–117. *pl. 8.* F. 1895.

Robinson, B. L. On the "List of Pteridophyta and Spermatophyta of Northeastern America," prepared by the Nomenclature Committee of the Botanical Club. Bot. Gaz. **20**: 97—103. 16 Mr. 1895.

Sargent, C. S., Editor. The Cherokee Rose. Gard. & For. **8**: 114. *f. 18.* 20 Mr. 1895.

Sargent, C. S., Editor. The Winter Aspect of Trees. Gard. & & For. **8**: 121. *f. 19.* Mr. 1895.

With illustration of the Beech-tree.

Schumann, K. *Phyllocactus Thomasianus.* Monats. Kakteenk. **5**: 6. *pl.* 20 Ja. 1895.

Stephani, F. Hepaticarum species novae.—VII. Hedwigia, **34**: 43–48. 15 F. 1895.

New species of *Herberta*, *Hygrobiella*, *Hymenophytum* and *Jamesoniella* including *Herberta dura* from Straits of Magellan, *H. pumila* from Argentina, and *Jamesoniella Leiboldiana* from Mexico.

Stevens, W. C. Apparatus for Physiological Botany. Bot. Gaz. **20**: 89–96. *pl. 9–12.* 16 Mr. 1895.

Terry, W. A. Diatoms of the Connecticut Shore.—VII. Am. Mo. Mic. Journ. **16**: 41–47. 1895.

Underwood, L. M. The Classification of the Archegoniates. Bull. Torr. Bot. Club, **22**: 124–129. 27 Mr. 1895.

Underwood, L. M. The Relation of the Red Cedar to our Orchards. Trans. Indiana Hort. Soc. **1894**: 81–84. 1895.

Popular account of *Gymnosporangium macropus* and *G. globosum.*

Walker, Ernest. How Plants use Spines and Prickles. Trans. Indiana Hort. Soc. **1894**: 86–92. 1895.

Wildeman, E. de. *Trentepohlia Pittieri.* La Notarisia, **9**: 6–7. 1894.

A new species from the leaves of various plants in the forests of Costa Rica.

Wiley, H. W. Sweet Cassava: its Culture, Properties and Uses. Bull. Div. Chemistry, U. S. Dept. Agric. 44: pp. 16. *f. 1. pl. 2.* 1894.

Discussion of *Jatropha Manihot.*

Wilson, J. The Russian Thistle—(*Salsola Kali Tragus*). Bull. Iowa Agric. Ex. Sta. 26: 3–7. 1894.

Wooten, E. D. New Mexico Weeds. Bull. N. Mex. Agric. Exp. Sta. 13: 36. *f. 15.* O. 1894.

Wright, J. S. A Guide to the Organic Drugs of the United States Pharmacopoeia. 12mo., pp. 118. Eli Lilly & Co. 1895.

Gives brief accounts of drugs and the species yielding them, and a conspectus of the natural orders of plants.

Contributions from the Herbarium of Columbia College.

[The numbers omitted from this list are out of print.]

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... **25 cents.**

No. 5. New or Noteworthy North American Phanerogams. By N. L. Britton (1888), ... **25 cents.**

No. 6. An Enumeration of the Plants Collected by Dr. H. H. Rusby in South America, 1886–1887. By N. L. Britton. (Twenty-three parts published; not yet completed.)

No. 7. The Genus *Hicoria* of Rafinesque. By N. L. Britton (1888), . **25 cents.**

No. 9. A List of Plants Collected by Dr. E. A. Mearns at Fort Verde and in the Mogollon and San Francisco Mountains, Arizona, 1884–1888. By N. L. Britton.

The General Floral Characters of the San Francisco and Mogollon Mountains and the Adjacent Region. By H. H. Rusby (1888), ... **25 cents.**

No. 11. Preliminary Notes on the North American Species of the Genus *Tissa*, Adans. By N. L. Britton (1889), ... **25 cents.**

No. 13. New or Noteworthy North American Phanerogams, II. By N. L. Britton (1889), ... **25 cents.**

No. 15. A Descriptive List of Species of the Genus *Heuchera*. By Wm. E. Wheelock (1890), ... **25 cents.**

No. 16. New or Noteworthy North American Phanerogams, III. By N. L. Britton (1890), ... **25 cents.**

No. 17. The Flora of the Desert of Atacama. By Thos. Morong (1891), . **25 cents.**

No. 20. New or Noteworthy North American Phanerogams, IV. By N. L. Britton. (1891), ... **25 cents.**

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No. 22. New or Noteworthy North American Phanerogams, V. By N. L. Britton (1891), ... **25 cents.**

No. 24. Review of the North American Species of the Genus *Xyris*. By Heinrich Ries (1892), ... **25 cents.**

No. 25. A Preliminary List of the Species of the Genus *Meibomia* occurring in the United States and British America. By Anna M. Vail (1892), . **25 cents.**

No. 26. A List of Species of the Genera *Scirpus* and *Rynchospora* occurring in North America. By N. L. Britton (1892), ... **25 cents.**

No. 27. Note on a Collection of Tertiary Fossil Plants from Potosi, Bolivia. By N. L. Britton (1892), ... **25 cents.**

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No. 30. *Ranunculus repens* and its Eastern North American Allies. By N. L. Britton (1892), ... **25 cents.**

No. 31. A Preliminary List of American Species of *Polygonum*. By John K. Small (1892), ... **25 cents.**

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No. 34. The N. American Species of *Lespedeza*. By N. L. Britton (1893), **25 cents.**

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EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 22. Lancaster, Pa., May 15, 1895. No. 5.

The Biological Status of Lichens.

By Albert Schneider.

For reasons to be enumerated, our present knowledge of lichens is very imperfect. Lack of attention is not the cause, as the voluminous literature on the subject will testify. The references, authentic and otherwise, number many thousands. It would be an endless task to bring together all the monographs, treatises, and especially the "fragments," referring to lichens. Lichenologists of ante-Schwendenerian time supposed that the question of the true nature of lichens and their position in the vegetable kingdom was permanently settled. Nothing was left for them to do but to issue "fragments" describing presumably new species and varieties. Collectors set to work in widely distributed and circumscribed areas to add their mite to the heap of confusion. We all know that the ultimate aim of science is to systematize; but no system can be formed from unknown material, whatever it may be. A scientist's first duty then is to study (*as far as possible*) his material before attempting to classify it. This careful studying of material is what the *mass* of lichenologists have heretofore failed to do. It is not my intention to enter into a historical review of lichenology, as that has already been thoroughly done by Krempelhuber and others. With the above introduction I shall now attempt to make somewhat clearer the present status of general lichenology.

The epoch-making researches of de Bary, Schwendener, Bornet and others have conclusively demonstrated the dual nature of the lichen structure; that is, it consists of a colorless hyphal portion homologous with certain filamentous fungi; and a green celled portion homologous with certain low forms of algae. The specific algal homologues have been pretty accurately studied out. Concerning the specific homologues of the fungal portion our knowledge is less accurate. But in regard to both symbionts we are certain of their originally independent ancestral forms. This theory of Bornet and Schwendener has from the very first met with strong opposition from nearly all lichenologists (taxonomists, so called). Even a considerable number of physiologists and morphologists misconstrued evident facts with unscientific perversity, notably Itzigsohn, Famintzin and Baranetzky. Even to this very day there are a number of lichenographers who persist in ignoring or directly opposing Schwendener's theory. This is simply additional evidence of the correctness of the statement "None are so blind as those who do not wish to see."

It would be useless to repeat the arguments based upon actual experimentation which conclusively prove the correctness of Schwendener's theory. There is, however, a question which Schwendener and his immediate followers have almost unanimously answered wrongly and that is the question of the true position of lichens in the vegetable kingdom. During the ante-Schwendenerian time, beginning with the earliest periods, most lichenologists looked upon lichens as autonomous structures, though this conclusion had no scientific basis founded on morphology and physiology. Their characteristic distribution and marked macroscopic appearance were thought sufficient to make them a distinct group. Schwendener assumed that lichens resembled certain groups of fungi, both in structure and in their manner of growth, and should therefore be classed under fungi as ascolichenes and basidiolichenes. It is much to be regretted that Schwendener did not see his mistake in time to avoid confusion and unnecessary and unwarranted opposition to his theory. I will frankly admit that I formerly thought it most expedient to classify lichens as modified fungi. But having since made a special study of lichen morphology, I now consider such a procedure both unscientific and impracticable. This idea is not original with me, nor do I stand as its only advocate. Many of the most recent scientific writers, notably Reinke, strongly uphold this view. I shall briefly consider lichens from the standpoints of morphology and physiology to show that they can only be treated as *autonomous structures having a phylogeny of their own.* I shall not consider it worth while to enter into word quibbling as to the meaning of "autonomy." If such were my desire I might well deduce good arguments to show that angiosperms are not autonomons, that they are simply modified gymnosperms, that gymnosperms are modified pteridophytes, pteridophytes modified mosses, etc., finally having it reduced to a primal cell; this cell could still be reduced to organic matter, and that to inorganic matter, etc. I shall consider as autonomous any comprehensive group of organisms having morphological and physiological characteristics differing from those of any other comprehensive group of organisms; meaning by comprehensive group any collection of allied individuals comprising natural species, genera and families. I will first show why lichens cannot be classed as fungi.

The method of reproduction in lichens is wholly different from that of fungi. It is true that lichen spores have a strong morphological resemblance to those of their probable homologues among the fungi. Functionally they differ widely. They cannot be considered specific reproductive organs of lichens as they formerly were of fungi, because they are not capable of developing into a complete mature lichen or even a fungus. They will indeed develop a mycelial network which will however not produce spores unless associated with its symbiotic alga. They can only be looked upon as *degenerate reproductive organs of their fungal ancestors.* This degeneracy is the more marked as we ascend the scale of lichen development. Taking one of the lower types, as exemplified in *Pyrenula*, we find spore organs having almost typical, fungal characters; that is, apothecia are prominent, paraphyses distinct and numerous, spore wall rather thick and colored, spores distinctly septate. These are the usual characters of fungal spore organs. Considering some of the higher types as exemplified in *Parmelia* and *Cladonia*, we find apothecia few or wholly wanting; when apothecia are present the asci are few in number, spore wall comparatively delicate and colorless, spores non-septate. There is no doubt that lichen spores still play a *part* in lichen reproduction. *This can however only take place when the spore with the specific algal symbionts are placed in a suitable environment.* That is, spores and algae must fall upon a spot where the algae can maintain existence independently until such time as the spores shall develop a mycelial network with haustoria with which to surround the algae, thus forming the beginning of a new lichen thallus. Should, for example, the spores with the requisite algae fall upon a dry rock the algae would die, and if the spores should subsequently develop there would be no algae with which to form a lichen. From this it is evident that lichen spores must be very unreliable as *assistants* in lichen reproduction. From the very nature of things, lichen spores are not true reproductive organs of lichens, hence their tendency to degenerate.

The question whether lichen spores are sexual or asexual products is still unsettled. The observations of Stahl in the case of *Collema microphyllum* have not yet been verified. If his observations prove to be correct, then we may assume that lichen spores are sexual products. I am, however, strongly inclined to believe that Stahl's observations were probably erroneous. From numerous examinations of so-called "spermagonia," I believe them to be parasitic fungi, of which the "spermatia" are the spores. From a rather hasty comparative study it seems probable that their homologues are to be found in *Septoria* or allied genera. For example, *Septoria Speculariae* presents the general morphological appearance of spermagonia. The fact that we readily recognize *Septoria* as parasitic fungi lies only in the nature of things. In case of *Septoria* the morphological and physiological contrast between host and parasite is great, while in the case of spermagonia this contrast is only slight. No one would ever think of recognizing *Septoria Speculariae* as the male reproductive organs of *Specularia perfoliata*, upon which it lives. Such a suggestion would certainly be highly ridiculous. Then why should spermagonia of lichens be recognized as male reproductive organs, especially since no one has demonstrated that they play such a function? According to Wiesner, spermatia do develop a mycelium which finally produces spermagonia. From this the true nature of spermagonia may safely be conjectured. To say the least, it is certainly unreasonable to assume that spermatia will at one time function as non-sexual spores, and at another time as male sexual organs. Further investigations will reveal the true nature of things. The sooner this is accomplished the better, as many lichenologists have already made the deplorable mistake of considering spermagonia as important characters in lichen classification. To classify plants according to the characteristics of the parasites found upon them would certainly be a questionable procedure in modern taxonomy.

Other characteristics which distinguish lichens from fungi are the presence of various chemical compounds, notably lichenin, which is never found in fungi.

Characteristics which distinguish lichens from fungi also distinguish them from algae. There is certainly less similarity between an alga and a lichen than there is between a fungus and a lichen, though several attempts had been made to classify them as algae. In general it may be stated that lichens *resemble* algae only in so far as the algal symbiont resembles algae. The *differences* will be brought out in the discussion of those characters which separate lichens from both algae and fungi. For convenience sake I will separate these characters into morphological and physiological. These are the characters which fully establish the autonomy of lichens.

MORPHOLOGICAL.

Lichens, macroscopically considered, have such a peculiar appearance that the most superficial observer is naturally led to suppose that they form a group by themselves. They are found in places where neither alga nor fungus can exist alone. Especially peculiar is their ability to resist low temperatures. Freezing only checks their growth. A temperature of —40 ° C. does not kill them. Such crude observations are however not sufficient to establish their individualism.

The lichen thallus is of special interest to the morphologist since this structure is typically lichenological. It always consists of the hyphal and algal symbionts. The algal symbiont is usually more centrally located, being surrounded by the hyphae of the fungal symbiont. Three types of lichen thallus may be recognized, namely, the crustaceous, the foliaceous and the fruticulose. The crustaceous type is the most rudimentary and cannot be said to to have even a dorsiventral structure, though one would naturally expect this from the nature of things. The lower surface differs only in having more numerous extended hyphal filaments to enable it to adhere more firmly to the substratum as well as to take up soluble food materials. The second type already indicates a considerable advance in the evolution of the lichen thallus. It is typically dorsiventral. Dorsal and ventral layers are semi-cortical in structure; that is, the hyphal cells are closely united and have only few air passages. Between these two layers is a layer of loosely interwoven hyphal tissue in which are imbedded the algae. From the lower surface extend the rhizoids. On the upper are found the apothecia (with exceptions, example, *Nephromium*) and soredia, besides the so-called "spermagonia" and occasionally accidental fungal and algal parasites. The third type (as exemplified by the vertical thallus of *Cladonia* and *Thamnolia*) shows a typical radial structure. Numerous examples showing the gradual gradation from the dorsiventral to the radial type can be found. In the radial type there is an outer semi-cortical layer, which usually differs from that of the dorsiventral cortical layer in that it is more compact. The fungal cell walls have become somewhat gelatinized and adhere very closely. Next to this layer, on the inside, is the layer of loosely interwoven hyphae containing the algae. The third and innermost layer consists of longitudinal closely united hyphae. Sometimes this thallus is hollow in the center, sometimes solid, containing a central core of closely united longitudinal hyphae.

Soredia are also typical lichen structures. They are very numerous in the higher forms of lichens (example, *Parmelia sorediata*), and are found on the dorsal surface of the thallus, more frequently near the margin. Each soredium is in reality a miniature thallus. It is usually spherical in form, the outer layer consisting of closely united hyphal cells; the central portion consists of algal cells and loosely interwoven hyphal filaments. Soredia contain all the elements necessary for the development of a new lichen.

From what has been stated above, apothecia can not be looked upon as typical lichen structures, yet their morphology is of great importance in the consideration of lichen evolution and classification. Some of the changes in apothecia indicating a probable higher or lower stage of development have already been referred to. As I intend to consider these changes more particularly in a future paper on lichen classification, I shall at present omit further discussions. I shall now briefly consider the physiological characters which distinguish lichens from both fungi and algae.

PHYSIOLOGICAL.

In their method of growth lichens stand alone. The two symbionts form a microcosmos which is enabled to perform the necessary life functions which were originally inherent in both, and in addition they have acquired new characteristics during their phylogeny as lichens, which unmistakably stamp them as autonomous structures. As a unit they can now exist where neither symbiont could exist alone. In spite of this intimate mutualism, it is not at all likely that the fungal symbiont is *wholly* dependent upon the algal symbiont for its food supply. For example, a lichen spore may develop to a considerable extent as a saprophyte upon decaying wood, humus, and other dead organic matter; nor is it at all likely that a lichen can develop upon purely inorganic matter, as, for example, pure quartz crystals. Of course, the spore, with the requisite algae or a soredium, has bound up within itself a certain amount of extra food material, which enables development to begin in the absence of all organic matter. The mycelial network then forms a structure for collecting within its meshes organic substances, carried to it by air and water currents; this allows growth to continue. No amount of food supply will, however, allow the fungal symbiont to mature without its algal symbiont, excepting perhaps the lowest forms. Thus we see that mutualism of fungus and alga is necessary to form a lichen. The fungal symbiont, considered by itself, still retains its ancestral function as a saprophyte; in addition it has acquired the habits of a semi-obligative parasite upon its algal symbiont. The algal symbiont, which has the function of chlorophyll-bearing plants in general, that of assimilating carbon, must be looked upon as a facultative parasite, since it can exist and mature independently of its fungal symbiont. This has been repeatedly demonstrated experimentally. Considered as a unit, the fungal portion of the lichen supplies the algal with water, the necessary mineral substances, N., O. and H., from the underlying substratum and air. The algal symbiont as a result of this unusual supply of food materials, forms an extra amount of carbon and nitrogenous compounds, which is assimilated by the fungal symbiont. Thus it is seen that the benefit derived from this association is mutual. The term "mutualism," proposed by Tubeuf, is very appropriate and may well supplant the equally correct but more complex expression "mutualistic symbiosis," proposed by Frank.

Reproduction by means of soredia stands without a parallel in the vegetable kingdom. They are of course asexual, and are formed in the algal zone of the lichen thallus by the symbiotic association of algae and hyphae. They may be designated as mutualistic brood buds. They are really vegetative reproductive organs, and on that account the objection may be raised that they are not true reproductive organs. I shall not here enter into a discussion on the ultimate difinition of reproductive organs. The fact remains that *soredia alone contain the necessary elements for forming a new lichen.* There is no doubt that the great majority of lichens are reproduced from soredia; in fact, this is the only means of reproduction in some species. The outer semi-cortical hyphal layer of soredia enclosing the algae maintains a sufficient degree of moisture to enable them to lie dormant for a long period of time, or until conditions are suitable for their development. They are certainly far more reliable than spores (associated with the necessary algae) as reproductive organs. In fact, as Reinke has indicated, lichen reproduction by the aid of spores is in most respects similar to reproduction by means of soredia. In *Endocarpon pusillum*, for example, some of the algae are ejected and with the spore adhere to the mucilaginous spore wall, thus forming a sort of soredium in which the spore represents the fungal element. If the algae are not ejected with the spores, the chances for developing a new lichen must indeed be slight, for reasons already given.

In my opinion sufficient reasons have been given why lichens cannot be classed with fungi, much less with algae, and must therefore be considered as an independent group. Based upon morphological and physiological considerations this group would naturally belong midway between fungi and algae.

In conclusion I shall offer a few suggestions on the probable origin and phylogeny of lichens. There is little doubt that various subdivisions of lichens indicate a polyphyletic origin. Of this polyphylogeny either one or all of several forms may have occurred. For example, in ascolichenes, a certain fungal type may have (during its phylogenyas a lichen symbiont) become so modified by its symbiosis with a given algal type, as to enable it to associate with other algal species; or it may be that the same algal type became adapted to one or even several fungal types. As to what the conditions actually were we are at present scarcely able to say. Of one thing we are, however, certain and that is that a lichen is the result of the mutualistic association of a fungal and an algal type. Though in general I agree with Reinke as to the origin of lichens, yet I am not so ready to assume (theoretically) that *Collema* represents the oldest lichen type. *Collema* is the result of the symbiotic association of the alga *Nostoc* with some fungus whose ancestral type is not definitely known. The mass of the lichen structure consists of the alga. As compared with some other lichens the following are some of the reasons why *Collema* does not represent the lichen prototype: 1. The alga has undergone considerable change by way of adapting itself to new environments. Originally it was no doubt accustomed to a high degree of moisture (as is its present homologue, *Nostoc commune*), while in its present form as a lichen it is able to exist on tree trunks, rocks, etc., as most other lichens. 2. Its thallus shows a considerable degree of differentiation, as exemplified in the closely allied genera *Hydrothyrio*, *Polychidium*, *Leptogium* and *Mallotium*. 3. Spores have probably become considerably degenerated as indicated by their thin colorless walls, and in many cases indistinct septae. As a rule apothecia are few, though there are exceptions to this. 4. Soredia, though not numerous, are more frequently present than in many other lichen forms.

The above are the main reasons why Collema is perhaps not the prototype of lichens. In my opinion the true prototype of lichens is perhaps to be found in those structures which were formerly recognized as pseudo-lichenes. They may be observed on nearly every tree trunk, on fences, rocks, pavements, etc.; in fact, anywhere where the lower forms of algae (especially *Protococcus viridis*) can exist. Examination of these algae will find them usually associated with fungal hyphae, sometimes forming extended thin thallus-like layers. The structure formerly recognized as *Lepra viridis* is an excellent example. Though apothecia are never found, yet I am inclined to believe that in so-called *Lepra* we find the beginnings of a future lichen. At least there are many lichens which show an inferior structure as compared with *Collema*, and for that reason are perhaps nearer the prototype. As an example we may mention *Pyrenula*. *Verrucaria* perhaps represents a degenerate type rather than a lower type of an ascending series, as is indicated by a rudimentary thalline structure associated with rudimentary or degenerate apothecia, spores and paraphyses. Whether a given lichen represents a low type of an ascending series or a degenerate higher form is in many cases difficult to decide; also the question as to the relative phylogenetic ages of various lichen groups. There is perhaps little doubt that basidiolichenes have had a much shorter phylogenetic history than ascolichenes. There are many problems in lichenology which must be left to the conscientious morphologists and physiologists to solve. In fact, we know so little of the life history of individual lichens that the time for final specific arrangement has not yet come. We, however, know sufficient of lichens as a whole to give them a proper position in the vegetable kingdom which is in reality the first step toward establishing a lichen system. Their proper position I have attempted to indicate in this paper.

New Species of Fungi.

By Chas. H. Peck.

Lepiota fulvodisca. Pileus thin, convex or nearly plane, obtuse or umbonate, viscid when moist, white, with the disk or umbo fulvous or tawny-brown; lamellae narrow, close, free, white; stem slender, flexuous, viscid, hollow, white or whitish, the base abruptly bulbous, the annulus thin, membranous, pure white; spores ovate-elliptical, .0003 to .0004 in. long, .00016 to .0002 in. broad, usually containing a shining nucleus and furnished with a slight apiculus at one end.

Pileus 1 to 1.5 in. broad; stem 2 to 3 in. long, 1 to 1.5 line thick.

Plant fragile, growing among fallen leaves in woods. Pasadena, California. January. Prof. A. J. McClatchie.

From *L. illinita* Fr. this species is separated by its tawny disk of the pileus, its membranous annulus, the bulbous base of the stem and the different shape of the spores.

CLITOCYBE PUSILLA. Pileus at first hemispherical or convex, then nearly plane, obtuse, sometimes with a very small umbo, dry, pruinose, grayish, flesh thin, whitish; lamellae narrow, close, adnate or decurrent, white; stem short, solid, pruinose, grayish; spores subglobose or very broadly elliptical, .00016 to .0002 in. long.

Pileus 3 to 8 lines broad; stem about 6 lines long, scarcely 1 line thick.

Densely gregarious or subcaespitose. On manure. Pasadena. February. McClatchie.

Apparently belonging to the tribe Disciformes and related to *C. Bresadolae* Schulz, but an exceedingly small plant for that tribe.

COLLYBIA ALBOGRISEA. Pileus fleshy, thin, convex or nearly plane, often somewhat irregular on the margin, glabrous, whitish or grayish, flesh white; lamellae broad, distant, adnate, white or whitish, the interspaces often venose; stem nearly equal, hollow, sometimes twisted, whitish or grayish, the lower part covered with a dense whitish, grayish or yellowish tomentum, the upper part naked or merely white-pruinose; spores broadly elliptical, .0002 to .00024 in. long, .00016 broad, generally containing a single shining nucleus.

Pileus about 1 in. broad; stem 1.5 to 2 in. long, 1 to 2 lines thick.

Plant often caespitose and then the pileus irregular from mutual pressure. Among fallen leaves. Pasadena. January. McClatchie.

The species belongs to the tribe Vestipedes.

MYCENA ELEGANTULA. Pileus membranous, conical or campanulate, sulcate-striate, brown or purplish-brown; lamellae distant, adnate with a decurrent tooth, whitish or pallid with the edge purplish-brown, the interspaces (in the dried specimens) venose or transversely wrinkled; stem slender, hollow, glabrous, sometimes with a loose grayish fibrillose tomentum at the base; spores oblong-elliptical, .00035 to .0005 in. long, .00016 to .0002 broad, usually containing one or two small nuclei.

Pileus, 4 to 10 lines broad; stem 1 to 2 in. long, .5 a line thick.

Gregarious or caespitose. Among fallen leaves under trees. Pasadena. December. McClatchie.

This plant may be distinguished from the closely related *M. atromarginata* Fr. by its smaller size and the purplish tint to the edge of the lamellae, and from *M. purpureofusca* Pk. by its differently shaped, longer spores.

OMPHALIA SEMIVESTIPES. Pileus very thin, deeply convex or subcampanulate, glabrous, grayish-brown in the dried state, paler when fresh; lamellae rather broad, distant, arcuate, decurrent, white or whitish; stem hollow, white or whitish, the upper half glabrous, the lower half clothed with a white mycelioid tomentum; spores elliptical, .0002 to .00024 in. long, .00012 to .00016 broad.

Pileus 6 to 12 lines broad; stem about 1 in. long, 1 to 2 lines thick.

Growing on much decayed wood. Newfoundland. May. Rev. A. C. Waghorne.

This plant is apparently related to such species as *O. setipes* Fr. and *O. grisea* Fr. and belongs to the tribe Mycenariae. It is easily recognized by the peculiar character of the stem. In the dried examples the upper glabrous part of the stem is shriveled and longitudinally striate, but the lower tomentose part is plump and even as in the fresh plant.

HYGROPHORUS ELEGANTULUS. Pileus convex or nearly plane, glabrous, viscid, grayish-yellow or slightly tawny, flesh white; lamellae distant, slightly decurrent, white; stem equal, solid, slightly floccose-squamulose at the top, elsewhere glabrous, glutinous, white or whitish, sometimes abruptly pointed at the base; spores elliptical, .0004 in. long, .0002 to .00024 broad.

Pileus 1 to 2 in. broad; stem 2 to 3 in. long, 3 to 4 lines thick.

Woods. Maryland. November. T. Taylor.

The species belongs to the tribe Limacium, and is related to *H. discoideus* Fr., from which it may be separated by its solid stem and larger spores.

ENTOLOMA FERRUGINANS. Pileus fleshy, convex, obtuse or umbonate, often irregular, hygrophanous, glabrous, shining, dark fuliginous or broccoli-brown, flesh whitish, fibrous and colored at the surface; lamellae 4 to 7 lines broad, adnexed, easily splitting transversely, grayish-salmon, becoming clay-color; stem solid, glabrous, yellowish or cream-color, blunt at the base or sometimes attenuated and radicating; spores subglobose, irregular or angular, .0003 to .0004 in. long.

Pileus 2 to 6 in. broad; stems 3 to 4 in. long, 4 to 8 lines or more in thickness.

Under oak trees. Pasadena. February. McClatchie.

This plant is related to *E. rhodopolium*, but is separated from it by its darker color and solid stem. According to Prof. McClatchie, the fresh plants have a strong odor resembling that of ferric chloride, and chemical tests showed the presence of iron. It is pronounced edible by him.

LEPTONIA EDULIS. Pileus thin, convex or centrally depressed, with or without an umbo, velvety, dark-gray; lamellae rather broad, subventricose, adnexed; moderately close, at first whitish or light drab, becoming flesh-color; stem slender, hollow, colored like the pileus, often with an abundant white mycelioid tomentum at the base; spores subglobose, angular, apiculate at one end, .0003 to .0004 in. long, containing a single large nucleus.

Pileus 6 to 18 lines broad; stem 12 to 18 lines long, .5 to 1 line thick.

Among grass and weeds. Pasadena. January.

According to Prof. McClatchie, this plant when fresh has a nutty flavor and is edible. The velvety appearance of the pileus has disappeared from the dried specimens. In some, the margin of the pileus is striate, but in the fresh plant the margin is said to be even.

ECCILIA NIGRICANS. Pileus thin, convex, umbilicate or centrally depressed, subzonate, unpolished, grayish-black; lamellae broad, distant, decurrent, light-drab or brownish, becoming tinged with flesh-color; stem short, hollow, grayish-black, commonly with an abundant white mycelium; spores angular, .0004 in. long, nearly as broad, containing a single large nucleus.

Pileus 6 to 18 lines broad; stem about 1 in. long, .5 to 1 line thick.

Grassy ground. Pasadena. January.

Prof. McClatchie's notes say that this plant has the odor and flavor of butternuts and that it is delicious when cooked. Also that when fresh the pileus is tomentose and the margin even, but these characters are not clearly shown in the dried specimens.

PHOLIOTA ANOMALA. Pileus at first hemispherical or subconical, then convex, glabrous, hygrophanous, broccoli-brown when moist, pale-yellow or cream-color when dry; lamellae adnate or slightly decurrent, subarcuate, pale becoming brownish-ferruginous, often white on the edge; stem cavernous or hollow with irregular transverse partitions, sometimes containing a cottony tomentum, whitish, with a slight evanescent annulus; spores elliptical, .0003 to .0004 in. long, .00016 to .0002 broad.

Pileus 8 to 18 lines broad; stem 1.5 to 2.5 in. long, 1 to 3 lines thick.

Sticks and leaves lying on the ground. Pasadena. January. McClatchie.

The species belongs to the tribe Truncigenae, section Hygrophanae. It is well marked by its fugacious annulus, subdecurrent lamellae and peculiar cavernous stem.

HEBELOMA FOEDATUM. Pileus fleshy, convex becoming plane or centrally depressed, glabrous, very viscid or glutinous, reddish cinnamon, flesh yellowish-white; lamellae subventricose, emarginate with a decurrent tooth, cinnamon-color, becoming mummy-brown; stem solid, equal or slightly thickened at the base, fibrillose, paler than the pileus; spores broadly elliptical, .00024 to .0003 in. long, .00016 to .0002 broad.

Pileus 1.5 to 3 in. broad; stem 1.5 to 2.5 in. long, 2 to 4 lines thick.

Streets of Pasadena. December. McClatchie.

The species is apparently related to *H. firmum*, *H. testaceum* and *H. glutinosum*, from all of which it is separated by its small spores. Its viscid pileus causes dirt to adhere to it in such quantity as to give the plant a very defiled, unattractive appearance.

FLAMMULA ANOMALA. Pileus deeply umbilicate or infundibuliform, often irregular, glabrous, whitish; lamellae narrow, close, decurrent, pale-ferruginous; stem short, irregular, whitish; spores globose, brownish-ferruginous, .00024 in. broad.

Pileus about 1 in. broad; stem 6 to 12 lines long.

Plant commonly caespitose. Ground. Trexlertown, Pennsylvania. October. Dr. William Herbst.

A whitish umbilicate pileus is unusual among species of Flammula. This plant appears to belong to the tribe Gymnotae.

TUBARIA PALLESCENS. Pileus fleshy but thin, convex or nearly plane, sometimes slightly depressed in the center, glabrous, hygrophanous, brick-red when moist, yellowish or cream color when dry; lamellae broad, adnate or slightly decurrent, tawny-buff, becoming brownish-ferruginous; stem slender, hollow, yellowish, with a white mycelium at the base; spores elliptical, .0003 in. long, .00016 broad.

Pileus 5 to 10 lines broad; stem 12 to 18 lines long, .5 to 1 line thick.

Sticks and leaves under trees. Pasadena. January. McClatchie.

When young, slight vestiges of a veil are visible, connecting the incurved margin of the pileus with the stem.

PLUTEOLUS LUTEUS. Pileus thin, at first subovate, then convex or subcampanulate, glabrous, viscid, slightly striate on the margin, yellow; lamellae numerous, close, free or but slightly adnexed, yellowish becoming ferruginous; stem slender, hollow, slightly thickened toward the base, striate at the top and there sprinkled with mealy particles, yellowish; spores elliptical, .0004 to .0005 in. long, .00024 to .0003 broad.

Pileus 6 to 12 lines broad; stem 1.5 to 2.5 in. long, 1 to 2 lines thick. Plant very fragile, gregarious. Under trees. Pasadena. December. McClatchie.

The yellow color and viscid pileus are prominent characters of this species. In some of the dried specimens the lamellae appear free, in others slightly adnexed, but because of the viscid pileus I have referred the plant to the genus Pluteolus.

CORTINARIUS VIRGATUS. Pileus thick, fleshy, hemispherical or convex, obtuse or subumbonate, slightly viscid, ochraceous tinged with olive-buff, conspicuously virgate with reddish fibrils, flesh dingy-white; lamellae subdistant, adnexed, at first subcinnamon, then ochraceous-russet; stem short, stout, solid, enlarged and fibrillose at the base, pale-ochraceous; spores subglobose or broadly elliptical, .00024 to .0003 in. long, .0002 to .00024 broad.

Pileus 3 to 4 in. broad; stems about 2 in. long, 8 to 12 lines thick.

Under oak trees. Pasadena. February. McClatchie.

This species is well marked by its stout habit and by the reddish fibrils of the pileus.

AGARICUS CALIFORNICUS. Pileus at first subconical, becoming convex, minutely silky or fibrillose, whitish, tinged with purple or brownish-purple on the disk, flesh whitish; lamellae close, free, pink becoming purplish, then blackish-brown; stem rather long, solid or stuffed, equal or tapering upward, distinctly and rather abruptly narrowed above the entire externally silky annulus, pallid or brownish; spores broadly elliptical, .0002 to .00025 in. long, .00016 to .0002 broad.

Pileus 1 to 3 in. broad; stem 1.5 to 3 in. long, 2 to 4 lines thick.

Under oak trees. Pasadena. January. McClatchie.

This fungus is similar in size, shape and habitat to *A. hemorrhoidarius*, but it is unlike that species in color, in the adornment of the pileus and in its color not changing where bruised or broken.

STROPHARIA BILAMELLATA. Pileus fleshy, convex, even, whitish or yellowish, flesh pure white; lamellae close, adnate, purplish-brown when mature; stem short, solid, white, with a well-developed pure white annulus which is striately lamellate on the upper surface; spores elliptical, purplish brown, .0004 in. long, .0002 to to .00024 broad.

Pileus 1 to 2 in. broad; stem about 1 in. long, 3 to 4 lines thick.

Streets of Pasadena. January. McClatchie.

This fungus is remarkable for the lamellated upper surface of the rather thick membranous annulus. These lamellae are uneven on the edge and in some cases they appear to extend upward on the stem till they meet the true lamellae. The plant is said by its discoverer to be edible. The color of the young lamellae is not shown by the examples.

HYPHOLOMA LONGIPES. Pileus thin, campanulate, even or obscurely striate on the margin, fibrillose becoming glabrous, hygrophanous, yellowish-brown when moist, brown or isabelline-brown when dry, the margin appendiculate with the very white floccose fugacious veil; lamellae narrow, close, adnate, white or whitish, becoming nearly black, often whitish on the edge; stem slender, long, hollow, striate at the top, white, with a white mycelioid tomentum at the base; spores elliptical, .0005 in. long, .0003 broad.

Pileus 1 to 1.5 in. broad; stem 2 to 5 in. long, 1 to 2.5 lines thick.

Plant fragile, growing among fallen leaves in very wet weather. Pasadena. September. McClatchie.

The disk of the pileus is so thin and the stem so completely hollow to the apex that in the dried specimens there is a depression or umbilicus in the center of the pileus.

PANAEOLUS INTERMEDIUS. Pileus campanulate or convex, even, glabrous, moist or hygrophanous, grayish-brown ; lamellae ascending or subarcuate, subdistant, adnate, black when mature ; stem slender, often elongated, hollow, grayish-brown, white-pruinose at the top ; spores oblong-elliptical, .0005 to .0006 in. long, .00025 to .0003 broad.

Pileus 6 to 12 lines broad ; stem 2 to 4 in. long, .5 to 1 line thick.

Rich soil along gutters or in cañons. Pasadena. January. McClatchie.

The margin of the pileus does not extend beyond the lamellae, and this character with the slender stem suggests the genus Psathyrella, but because of the absence of striae on the pileus it seems best to refer the plant to the genus Panaeolus.

PANAEOLUS DIGRESSUS. Pileus hemispherical or convex, glabrous, bay-red ; lamellae very broad, plane, distant, adnate, purplish black with a white edge ; stem short, floccose-fibrillose toward the base, striate at the apex, hollow, a little paler than the pileus ; spores broadly elliptical, .0005 to .0006 in long, .00035 to .0004 broad.

Pileus 4 to 6 lines broad ; stem about 1 in. long, 1 line thick. On dung. Pasadena. July. McClatchie.

This plant also diverges from the generic character in its lamellae extending quite to the margin of the pileus, and in its unpolished stem.

COPRINUS CALYPTRATUS. Pileus when mature adorned with a few grayish floccose scales and crowned with a persistent stellately split membranous dingy-yellow or subtawny calyptra, radiate striate to the disk, grayish-flocculent along the ridges of the striae, blackish ; lamellae free, dark lead color becoming black ; stem equal, hollow, white, becoming blackish in drying except at the base, neither annulate nor distinctly volvate ; spores elliptical, black, .0006 to .0008 in. long, .00045 to .0005 broad.

Pileus about 2 in. broad ; stem 3 to 4 in. long, 2 to 3 lines thick. Open cultivated ground. Rockport, Kansas. August. E. Bartholomew.

This species is well marked by the persistent membranous calyptra that adheres to the summit of the pileus. Its margin is split into four to six broad rays. The change of color in the stem is similar to that ascribed to the stem of *C. sterquilinus* Fr., but our plant differs from that in its calyptra and in the absence of an annulus and volva at the base of the stem. Only mature specimens were seen, consequently the characters of the young plant remain unknown and the description to that extent is defective.

COPRINUS JONESII. Pileus submembranous, campanulate becoming broadly convex or expanded and split or revolute on the margin, very blunt or truncate at the apex when young, everywhere covered with tawny-gray or pale-cervine floccose scales which wholly or partly disappear with age revealing the striate surface beneath; lamellae crowded, linear, free, at first white or whitish, becoming black; stem equal or slightly tapering upward, minutely floccose, hollow, white; spores black, broadly elliptical, .0003 to .00035 in. long, .00025 broad, with an apiculus at one end.

Pileus 1 to 2 in. broad; stem 2 to 3 in. long, 2 to 3 lines thick.

Plant fragile, sometimes caespitose. In a cellar. Vermont. April. Prof. L. R. Jones.

The species is closely related to *C. fimetarius*, of which it might easily be considered a variety, but it is easily distinguished by the truncate apex of the young pileus, the differently colored scales and the smaller spores. *C. soboliferus* Fr. has the pileus truncated at the apex, but it is a very different species.

COPRINUS APICULATUS. Pileus membranous, campanulate or deeply convex, acute or apiculate, furfuraceous, plicate-striate to the disk, grayish; lamellae few, subdistant, reaching the stem, black; stem filiform, glabrous, white; spores elliptical, black, .0003 in. long, .00016 broad.

Pileus about 3 lines broad; stem 1 to 1.5 in. long, scarcely half a line thick. Lewiston, Pennsylvania. Mrs. E. B. Noyes.

BOLETINUS BOREALIS. Pileus fleshy, convex, obtuse or subumbonate, brownish yellow, obscurely and somewhat reticulately streaked with reddish-brown lines; pores large, angular, unequal, slightly decurrent, brownish-yellow; stem short, equal or slightly tapering upward, brownish-yellow with a whitish mycelioid tomentum at the base; spores oblong, .0004 to .0005 in. long .00016 to .0002 broad.

Pileus 1 to 2 in. broad; stem about 1 in. long.

Sandy soil. Capstan Island, Labrador. October. Waghorne.

The markings of the pileus appear as if due to the drying of a glutinous substance. The radiating lamellae and the transverse partitions of the interspaces are very plainly shown. Described from two dried specimens.

Boletus inflexus. Pileus convex, glabrous, viscid, yellow, often red or reddish on the disk, the margin thin, inflexed, concealing the marginal tubes, flesh whitish, not changing color where wounded; tubes rather long, adnate, yellowish, becoming dingy-yellow with age, the mouths small, dotted with reddish glandules; stem rather slender, exannulate, solid, viscid, dotted with livid-yellow glandules; spores yellowish, .0004 to .0005 in. long, .00016 to .0002 broad.

Pileus about 1 in. broad; stem about 2 in. long, 2 to 4 lines thick.

Open woods. Trexlertown. September. Herbst.

This *Boletus* belongs to the tribe Viscipelles. It is remarkable for and easily recognized by the inflexed margin of the pileus, which imitates to some extent the appendiculate veil of *Boletus versipellis*. It sometimes grows in tufts. The paper in which fresh specimens were wrapped was stained yellow. *Boletus Braunii* Bres. has an inflexed margin, but that is a much larger plant with a yellowish-brown pileus, a fibrillose stem and much smaller spores.

Polyporus anceps. Effuso-reflexed or resupinate, inseparable from the matrix, firm, subcorky but flexible, white; pileus narrow, about 6 lines broad, laterally elongated or confluent, minutely downy, sometimes rugosely pitted; pores minute, subrotund, commonly 2 to 3 lines long, the dissepiments obtuse; mycelium white, permeating the bark and wood.

Dead trunk of hemlock, *Tsuga Canadensis*. Stony Brook, Massachusetts. October and November. Prof. E. A. Burt.

The plants are commonly resupinate, but sometimes reflexed, forming a narrow pileus about half an inch broad but extending laterally for several inches. They are suggestive of the first year's growth of *P. connatus* Fr., but they do not revive the next year, and they have a different habitat. Though differing somewhat in texture they are apparently related to such species as *P. semisupinus* and *P. semipileatus*, and with them they serve to connect the genus *Polyporus* with the genus *Poria*.

Sparassis Herbstii.—Plants much branched, forming tufts 4 to 5 in. high and 5 to 6 in. broad, whitish, inclining to creamy-yellow, tough, moist, the branches numerous, thin, flattened, concrescent, dilated above and spatulate or fan-shaped, often somewhat longitudinally curved or wavy, mostly uniformly colored, rarely with a few indistinct, nearly concolorous, transverse zones near the broad entire apices; spores subglobose or broadly elliptical, .0002 to .00025 in. long, .00016 to .0002 broad.

Trexlertown. August. Herbst.

The species is evidently closely allied to *S. spathulata* Schw., but differs especially in its paler color, with no rufescent hues, in its much more branching habit and in the absence of any distinct zones.

BATTARREA ATTENUATA. Exoperidium unknown; endoperidium 2 in. or more in breadth, the basal part hard, thick, even and concave beneath, convex above and somewhat coarsely reticulate by the bounding walls of broad shallow pits; stem 8 to 10 in. long, gradually attenuated toward the base, hard, almost woody, solid, rough except at the top with rather coarse spreading or reflexed scales, brown externally, rusty-brown within; spores globose, ferruginous, .0003 in. broad; threads of the capillitium destitute of spiral thickenings.

Plants commonly growing in tufts of 3 to 5 individuals.

Dry sandy soil. Nevada. Collected by C. W. Irish; communicated by Dr. Thomas Taylor.

The single dried specimen from which, with notes kindly communicated by the collector, the above description was derived, was past maturity and destitute of any volva or exoperidium. The upper part of the endoperidium, which is apparently membranous, had nearly all disappeared, and but a mere remnant of the spores and capillitium remained. It is very unsatisfactory to attempt the description of a species from such imperfect data, yet the characters seen are so peculiar and distinct that I have been willing to strain a point in order to make this remarkable plant known. It does not agree rigidly with the characters ascribed to the genus Battarrea, differing apparently in the solid stem, the absence of spiral thickenings in the capillitium threads and in the coarsely pitted subreticulate hymenial substratum, so that it might easily be taken as the type of a distinct genus.

The dried specimen has a strong, unpleasant odor, indicating its relationship to the Phalloideae. From the notes of Mr. Irish we learn that the long stem, which is about half an inch thick at the base and one and a half at the top, is almost wholly buried in the soil, and that the plants appear above the surface only in seasons after heavy snow falls, whose gradual melting has moistened the earth deeply.

TYLOSTOMA SEMISULCATUM. Peridium subglobose, usually a little longer than broad, 6 to 8 lines broad, 9 lines long, glabrous above, ferruginous-tomentose on the lower half; ostiolum entire, stem equal, about 2 in. long, even and glabrous or but slightly furfuraceous on the upper part, the lower part longitudinally sulcate, whitish; spores ferruginous, globose, .00016 to .0002 in. broad; threads of the capillitium colorless, not septate.

Sandy soil. Nevada. Collected by C. W. Irish; communicated by T. Taylor.

This species is separated from *T. mammosum* Fr. by its peridium, which is tomentose on the lower half and not depressed, and by its stem, which is distinctly furrowed in its lower half.

LYCOPERDON BELLII. Peridium about 2 in. broad, subglobose, sessile, grayish or yellowish-brown, exterior peridium continuous, adorned with numerous persistent hard angular irregular or substellate warts which are smaller toward the base, separable at maturity from the inner peridium and falling away in flakes or patches; the inner peridium thinner, paler, glabrous; capillitium composed of long slender interwoven, slightly colored and occasionally branched filaments, a little broader than the diameter of the spores; spores globose, olive-brown, .00024 to .00028 in. broad.

Rocky ground. Digges Island, Hudson's Bay. August. Collected by R. Bell; communicated by Prof. J. Macoun.

This puff-ball is peculiar in its continuous but warty exterior peridium, which is less friable than that of *L. separans*. The peridium appears to rupture irregularly, as in *Calvatia*. It is also well marked by the dark olive-brown spore mass.

EXCIPULINA OBSCURA. Perithecia cupulate, ¼ to ½ line broad, sessile, black, the margin at first incurved, then erect, thin; hymenium subgelatinous; spores subfiliform, curved, plurinucleate or obscurely pluriseptate, hyaline, .0012 to .0018 in. long, .00016 broad, supported on short sporophores.

Bark of hemlock trees, *Tsuga Canadensis*. Newfoundland. Waghorne.

MELASMIA IMITANS. Perithecia hypophyllous, membranous, variable in size and shape, commonly subelliptical or oblong, somewhat confluent in nerve-following lines, rugosely uneven, black, opening irregularly; spores subcylindrical, straight or nearly so, colorless, sometimes obscurely plurinucleate, .0008 to .0012 in. long, .00016 to .0002 broad, oozing out and forming pallid globular or irregular masses or short thick tendrils.

Lower surface of living fronds of *Pteris aquilina*. California. Prof. M. A. Howe.

This fungus imitates *Phyllachora pteridis* in habitat and general appearance, and might easily be supposed to be the conidial state of it. The lines of the perithecia are more narrow and less prominent. The masses of discharged spores are rather large and very numerous and partly conceal the black perithecia beneath them.

CAEOMA ABERRANS. Pustules suborbicular, slightly elevated, .5 to 1 line broad, at first covered by a whitish membrane which finally disappears revealing the mass of orange-yellow spores; spores subglobose or elliptical, smooth or nearly so, .0007 to .0009 in. long.

Bark of living alder. Newfoundland. May. Waghorne.

This fungus is peculiar in its habitat. The spores do not easily separate from each other, but possibly this is due in some measure to immaturity.

ASPERGILLUS SUBGRISEUS. Grayish; sterile hyphae creeping; fertile erect, continuous, simple, .0003 in. thick, terminating above in an inflated subglobose vesicle .0012 to .0016 in. broad; sterigmata none or obsolete; spores globose, .00016 in. broad.

On *Corticium amorphum*. Newfoundland. Waghorne.

This species is separated from the related *A. griseus* by its larger spores, continuous fertile hyphae and by the absence of distinct sterigmata.

LEPTOGLOSSUM LATUM. Club 3 to 6 lines long, nearly or quite as broad, soft when moist, rather fragile when dry, compressed and somewhat irregular, black; stem about as long as the club, black; asci clavate-cylindrical, .0045 to .005 in. long, about .0005 broad, 8-spored; spores crowded in the ascus, oblong or cylindrical, straight or slightly curved, continuous, obtuse, colorless, .001 to .0016 in. long, .0002 to .00024 broad; paraphyses colored, thickened at the top and sometimes recurved.

Sandy soil. Labrador. September. Waghorne.

A species very peculiar in its broad compressed club. The colored paraphyses are conspicuous under the microscope. They project slightly above the surface of the receptacle and give it a soft, almost velvety appearance.

VALSA BREVIS. Pustules numerous, rather prominent, perithecia 10 to 20 or more in a pustule, nestling in the inner bark; ostiola even, black, barely emerging from and dotting or obliterating the orbicular or elliptical erumpent subpulverulent disk; asci .0008 to .001 in. long; spores allantoid .00024 to .0003 in. long.

Bark of balsam fir, *Abies balsamea*. Labrador. Waghorne.

This fungus is allied to but differs from *Valsa Friesii* in its larger pustules, more numerous perithecia and shorter asci and spores. The color of the disk is grayish or grayish-green.

HYGROPHORUS NIGRIDIUS. Pileus fleshy, convex, obtuse or subumbonate, glabrous, grayish-brown or black-brown, often a little darker in the center, flesh white; lamellae distant, decurrent, white; stem rather slender, solid, brownish, white at the top; spores elliptical, .0004 to .0005 in. long, .00024 to .0003 broad.

Pileus 1 to 2 in. broad; stem 1 to 2 in. long, 2 to 4 lines thick.

Gregarious or rarely two or three united at the base. Pine and fir tree woods. Prince Edwards Island. October and November. J. MacSwain.

This fungus differs from *H. caprinus* Fr. in its smaller size, glabrous pileus and larger spores. A description of it was published in the Country Gentleman of November 29, 1894, but one is here given that it may be more readily accessible to mycologists.

In many of the foregoing descriptions I have been obliged to give the colors indicated by the dried specimens. It is not likely therefore that they will in all cases agree rigidly with the colors of the fresh plant.

Hypericum boreale (Britton) and related Species.

By EUGENE P. BICKNELL.

At York Harbor, Maine, *Hypericum Canadense* L. abounds, presenting itself in varying forms; *Hypericum majus* (Gray) Britton frequently grows with it, either strongly typical or with aberrant tendency; *Hypericum mutilum* L. is common also.

More characteristic of the region, however, than any of these is a small species, which grows in abundance in open situations, about the muddy borders of pools or in moist sandy soil, and shows some interesting lines of variation. Some fragmentary specimens, collected in 1888, were pronounced by Dr. Britton to be the little known *Hypericum Canadense* var. *minimum*,* a plant which had never been well understood, but which, on account of its narrow leaves, had been associated unhesitatingly with *H. Canadense*. Now, however, the study of a full series of specimens, collected at York Harbor in August, shows clearly that, though in one of its forms the plant certainly bears a strong general resemblance to forms of *H. Canadense*, its real affinity is with *H. mutilum*, to which, indeed, it is nearly allied. Certain noteworthy differences, however, forbid its direct reference to that species, and give it an identity which is unmistakable when once the plant is understood. These differences, moreover, prove to be constant over a wide area; at least there is nothing to discredit them in specimens which show the plant to have an extensive distribution, ranging along the coast and islands of Maine into Nova Scotia, and westward through Canada. That it also extends southward in the mountains is attested by a specimen from Luzerne county, Pennsylvania, and one from an elevated station in northern New Jersey.

It is to be noted of this New Jersey specimen that it shows a near approach to *mutilum* and may, perhaps, be taken as presumptive evidence that the two plants intergrade. If such be the fact, however, it is, after all, only a part of the complementary fact that elsewhere the same plants have reached a condition of complete separation. The sub-species of one region has become a full species elsewhere in its range.

In cases such as this of complete differentiation in one region, how are we to deal with intergradation in another? It is practicable to recognize a plant at the same time as a variety and as a species according as to whether it occurs in one or in another part of its habitat? It can only be said that if this condition of things exists in nature we cannot refuse to recognize it, and shall have to adjust our methods to it as best we may. But while we cannot dissect the facts of nature too delicately for certain purposes of botanical study, for other, more general purposes, we can often reach better practical results with duller tools. For general pur-

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*Dr. Britton has since shown that the name *minimum* of Choisy is not properly applicable to this plant, and has therefore designated it *Hypericum Canadense* var. *boreale*. Bull. Torr. Club, **18**: 365. 1891.

poses, therefore, what shall be our practice in cases similar to the one before us? The older idea would appear to have been, Somewhere a variety, everywhere a variety; with equal, as it seems to me with better reason, it may be held, Somewhere a species, everywhere a species; that is to say, everywhere where individuals of such a *regional species* are found upholding the characters which distinguish their type in the region of its perfect emancipation. Let *intermediates* be frankly accepted as intermediates, not feared or avoided as elements of confusion or as being necessarily prejudicial to this or that otherwise unexceptionable " species "; let them be sought for and studied; in time we may come to learn from them, in one case perhaps, that they represent weakening links between diverging forms; in another, that they afford indices to old relationships; in yet another, it may be that they mark the first steps in a union of two allied species into a broader single one.

Upon these views the plant here defined is named with specific rank as *Hypericum boreale* (Britton). The conceptions of other botanists may require them to write *Hpericum mutilum boreale*, or, if even more conservative, *Hypericum mutilum* var. *boreale*. In any case, the fact of nature sought to be expressed is the same.

HYPERICUM BOREALE (Britton). From 1–18 in. high, mostly 3–8 in.; stem obscurely quadrangular to terete, upright from an assurgent, or reclined and rooting base, rarely erect from the root, simple or cymose-branched. Main stem-leaves from elliptic-linear to narrowly oblong and elliptic-oblong, or one or two pairs in the cyme sometimes slightly broadened to a sub-clasping base, those of the lower part of the stem much reduced and crowded, oval to short-oblong, at the very base of the stem sometimes thickened and transformed into small lanceolate overlapping scales. The small form of the plant which has been known as *H. Canadense* var. *minimum*, has a simple stem, leafy-cymulose at the top, bearing many pairs of nearly linear or linear-oblong leaves, sometimes no larger than 3″–4″ × 1″. Another small form has fewer short-oblong obtusely rounded, small leaves, mostly narrowed to the base, but the pair which subtends the cymule sometimes broadened and sub-clasping. Larger plants may be cymose-branched, even from the base, with narrowly oblong or elliptic leaves reaching an extreme size of 16″ × 3″ or 4″. Cymes leafy-bracted throughout, varying from very simple and few-flowered to compound and contractedly many-flowered. Bracts foliaceous throughout, oblong to linear, obtuse. Sepals linear to oblong-linear, obtuse. Flowers about 2½″ broad. Capsules 2″–2½″ long by 1″–1¼″ broad, oblong, rounded or abruptly contracted to the apiculate apex, membranaceous and strongly cross-wrinkled, the exposed portion deep purplish in color almost from the first, and conspicuously exceeding the sepals. Seeds relatively large, .03 inch long, linear, 3–5 times longer than broad, pale, strongly longitudinally furrowed and minutely cross-lined, under the microscope suggesting a miniature ear of corn.*

As compared with *boreale*, *mutilum*, though having sometimes the assurgent base of the stem, is commonly erect from the root, the stem distinctly quadrangular, the stem-leaves, which reach an extreme size of 14′×7″, are throughout larger and much broader, and vary in shape from ovate-orbicular to ovate-oblong, often gradually narrowed from the broadly-dilated base to the obtuse tip, sometimes oblong, but always with a broad sub-clasping base; 5–7-nerved, thin and much reticulated instead of thicker and often 3-nerved, with the reticulation sparse, obscure or wanting; the cymes more compound and delicately dichotomous, with minute and setaceous instead of leafy bracts; the capsule smaller, even only half the size (1′–2″× ½″–1″), mostly ovoid- or oblong-conical, often but little exceeding the sepals, commonly greenish or, in age, greenish-purple, instead of early deep purple; the seeds smaller, oblong, only 2–3 times longer than broad, yellowish-brown and shining instead of dull whitish, very minutely cross-wrinkled, not furrowed, but sometimes indistinctly striate.

The seeds of *boreale*, while differing strikingly from those of *mutilum*, resemble somewhat those of *Canadense*, which, though shorter, are of the same pale color, and are evidently striate—striate-angled, however, rather than furrowed. The seeds of *majus* prove to differ from those of *Canadense* in respect of size, color and surface character, much as those of *mutilum* differ from those of *boreale*. The broad-based leaves of *majus* and *mutilum* here comes to mind and suggests a sort of parallelism between *Canadense* and *majus* on the one hand and *boreale* and *mutilum* on the other.

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* Besides the York Harbor series, specimens of *Hypericum boreale* have been examined, as follows:

Somesville, Mount Desert Island, Maine, Aug. 25, 1890, Edward L. Rand.

Prince Edward's Island, Aug. 2, 1888, John Macoun.

St. John's, Newfoundland, Aug. 6, 1894, B. L. Robinson and H. Schrenk.

Notre Dame du Lac, Termiscouta Co., Canada, Aug. 13, 1887, John I. Northrop.

"Vermont."

Lily Lake, Luzerne Co., Pa., Aug. 16, 1889, John K. Small.

Morris Pond, New Jersey, Sept. 11, 1890, N. L. Britton.

This last is the apparently intermediate specimen already referred to. It is the only example seen in which there are any minute bracts in the cymes.

Hooker's description of *H. quinquenervium* of Walter, in Fl. Bor. Am. 1: 110, clearly refers to *H. boreale*, as here defined, and as clearly excludes true *H. mutilum*, of which *quinquenervium* is a synonym. The habitat of the plant is given as "Canada to Lake Winipeg. Dr. Richardson. Frequent in upper Canada."

It may be noted that *majus* has the smallest and narrowest seeds of the entire series; *boreale*, the smallest plant of all, having the largest seeds.

The relationship between *Canadense* and *boreale* needs no extented comment. It is true that from the leaves alone some forms of each plant would scarcely be regarded as different, but the character of the inflorescence of each is perfectly destinctive: *Canadense* will be found to differ constantly in its more strict and compound, minutely bracted cymes, with more or less tapering capsules and calyx lobes.

It has just been said that forms of *Canadense* cannot by the leaves alone be separated from forms of *boreale*. This is equally true of *majus*. All three species assume in some of their states a narrowly oblong form of leaf which is practically the same in all. In specimens of *majus*, however, which exhibit this form of leaf, the other distinctive characters remain unimpaired: it maintains the large pod, long tapering sepals, and characteristic seeds. Not so, however, *Canadense*. In the oblong-leaved form collected at York Harbor, there is a general difference also in the inflorescence and capsules; the cyme is less strict and more delicately branched, even becoming somewhat diffuse, and the short-pedicelled capsules are more numerous and crowded, and only about half the usual size, 1″–2″ instead of 2″–3″ long; the seeds also take on a darker color, and seem to approach those of *mutilum*. Indeed, some examples of this form have much similarity to less branched forms of *mutilum*, and actually seem to be implicated somehow with that species. In fact, in the case of some immature specimens, it can scarely be said to which species they belong.

Compared with fully typical *Canadense*, this form presents a striking contrast, and in studying the group I have found it convenient to label it var. *parvicarpum*.

Further Remarks on Family Nomenclature.

By Dr. V. Havard.

It is generally admitted that the animal and vegetable kingdoms cannot be classified on the same lines and divided into groups of the same value. Species and genera are nearly identical in the two kingdoms, but as we rise above genera the similarity is less apparent and the higher we go the more doubtful becomes the analogy between the groups, so that near the summit of the scale no comparison is possible. This is due to the great dissimilarity in the nature of the organisms, the infinitely more numerous and varied functions of animals and the greater difficulty of ascertaining their natural relationship. From these considerations it follows that the application to both kingdoms of one uniform and identical nomenclature is impracticable; but, were it otherwise, the desirability of different and distinctive endings would still be manifest.

Zoölogists appear to have reached a satisfactory uniformity in the terminations of the names of their principal groups. As early as 1845, the Association of American Naturalists, convened at New Haven, adopted the following proposition:

"It is recommended that names of families should end uniformly in *idae* and sub-families in *inae*."

These endings were then in general use; they were confirmed at the meeting of the A. A. A. S., in 1877, and are now invariably accepted. The name of the family or sub-family is *always* that of one of its genera with the above endings. It is to be noticed, however, that animal families usually contain but few genera, not rarely only 2 or 3, often only 3 to 5, and seldom more than 10 or 15. Perhaps they might be more correctly assimilated to botanical tribes. The term *tribe* appears to be very seldom used by zoölogists, the name of the group intermediate between the family and genus being mostly *sub-family* in *inae*.

A cause of confusion, as pointed out by Mr. L. M. Underwood in the March Bulletin, is the variable conception of *order*, being considered by phanerogamic botanists a synonym of *family*, while, by zoölogists and the majority of cryptogamists, it is applied to the next higher group above family. It seems to me that a desirable step in the direction of uniformity would be taken if all botanists would, in this regard, conform to the usage of zoölogists; for, although we need not strive after similarity of nomenclature in the two kingdoms, yet we should avoid, so far as practicable, the use of the same appellations with a distinctly differeut meaning.

The termination in *aceae* is the one now generally accepted by botanists for family names. It is strictly in accordance with good Latin and otherwise unobjectionable. The vexed question is, can it and must it be applied in all cases? A. de Candolle in his "Laws of Botanical Nomenclature" (1867) establishes three exceptions:

1st. When the genus from which is derived the family name ends in *ix* or *is* (genitive *icis, idis* or *iscis*) the termination *iceae, ideae* or *ineae* is admitted: SALICINEAE, BERBERIDEAE, TAMARISCINEAE.

2d. When the genus from which the family name is derived has a name of unusual length, and there is no tribe founded upon it, the termination in *eae* is admitted: DIPTEROCARPEAE from *Dipterocarpus.*

3d. For a few large families, named long ago, and now everywhere known under their irregular names, the latter are maintained: CRUCIFERAE, LEGUMINOSAE, GUTTIFERAE, UMBELLIFERAE, COMPOSITAE, LABIATAE, CUPULIFERAE, CONIFERAE, PALMAE, GRAMINEAE.

These exceptions, when formulated, expressed the best conservative usage of the day, but it is apparent they have lost much of their strength and I doubt whether their illustrious author would now insist upon the first two. The first has long since been disregarded; thus in Gray's Manual, as well as in Pflanzenfamilien and Baillon's Histoire des Plantes, we have SALICACEAE, BERBERIDACEAE, PLANTAGINACEAE, ORCHIDACEAE, AMARYLLIDACEAE, etc. The length of the name is a point upon which we need not dwell; so long as a name is correctly constructed the number of syllables cannot be of much moment; thus in Baillon's Histoire we have DIPTEROCARPACEES and CENTROLEPIDACEES, and in Pflanzenfamilien, POTAMOGETONACEAE, HYDROCHARITACEAE, etc. It is therefore obvious that whenever the name of a family is derived from that of a genus the termination in *aceae* is applicable *without exception.*

The third exception presents serious difficulties. Here the family name is descriptive, that is, not based upon a genus but derived from some structural characteristic. Can the ending *aceae* be applied to it? This ending (from *akos* or *acus*) is an adjective-suffix, and therefore only applicable to a substantive, *e. g.*: *rosa, rosaceus; lilium, liliaceus,* &c., the e being inserted for reasons of enphony. It cannot be affixed to adjectives (like *compositus, coniferus, leguminosus, gramineus,* &c.), and such names as COMPOSITACEAE, CONIFERACAE, &c., with two adjective terminations, are obviously inadmissible. But it happens that all family descriptive names (COMPOSITAE excepted) are based upon a substantive (*conus, umbella, crux, legumen, labium, cupula, gramen,* &c.), so that we can replace the ordinary and variable adjective-ending by the uniform *aceae* and correctly form such family names as CONACEAE, UMBELLACEAE, LEGUMINACEAE, practically equivalent to CONIFERAE, UMBELLIFERAE, LEGUMINOSAE. The principle was recognized by Linnaeus who adopted such descriptive names as AMENTACEAE, PAPILIONACEAE, SPATHACEAE, &c.

But admitting, as we may, that CONACEAE and LEGUMINACEAE are as correctly constructed as ROSACEAE and LILIACEAE, it is still true that, although with the same ending, they convey an entirely different meaning; the former are plants *with* cones, *bearing* legumes, while the latter are plants *like* the Rose, *similar to* the Lily; the former imply the possession of a certain character, the latter imply similitude to a type genus. Clearly this is not admissible. The uniformity we are striving for must be not only in outward form but likewise in the mode of construction and inward meaning.

We are thus forced to the conclusion that the ending *aceae* is inapplicable to the names under consideration, and that no change in their construction is possible or advisable. What is then to be done? Two alternatives offer themselves: Leave them alone, as they have stood for several generations of botanists, or abolish and replace them by the first published generic names as proposed by Mr. Barnhart. The latter course will commend itself to all who think uniformity essential, and is urged upon us by the example of zoölogists, but such a radical change will not be easily acquiesced in. In the case of zoölogists, the family usually containing only few genera, it is comparatively easy to adopt the name of one of them for that of the family, and, as a rule, the characters of the adopted genus will not as widely differ from those of the other genera as, say, *Fragaria* does from *Prunus*, *Cassia* from *Trifolium* or *Pinus* from *Ginkgo*, so that such name is readily acceptable as representative of the family. It happens that the botanical families in question are among the largest of the vegetable world and it seems difficult to recognize CASSIACEAE as the representative of all LEGUMINOSAE, and AMMIACEAE as that of all UMBELLIFERAE. The difficulty would be lessened if botanists, instead of extending the boundaries of families as has been the tendency in recent times, endeavored to restrict them to the lowest admissible limits, those, for instance, of several of our well defined suborders.

I am not prepared to make a choice between the two alternatives. Perhaps a majority of botanists would now prefer that the old familiar names be maintained. Be that as it may, a decision will soon impose itself and, judging from the present trend of thought, at least in this country, it is safe to predict that long and honorable usage will eventually be sacrificed to the claims of uniformity and stability.

If we admit the law that the family name must in all cases be based upon that of a recognized genus, we still have difficulties to surmount; what is a "recognized" genus? The comparative instability of genera is well known; authors do not agree upon their value and limitations; should the family name be exposed to this insecurity? The danger of possible changes from that source is very much mitigated by A. De Candolle's law:

"An old genus name which has become the name of a section or species can be maintained as the radical of a family name: LENTIBULARIACEAE from *Lentibularia,* HIPPOCASTANACEAE from *Aesculus Hippocastanum,* CARYOPHYLLACEAE from *Dianthus Caryophyllus*, etc."

If this law can be accepted by nomenclature reformers, their path will be made much smoother and we shall be the more readily inclined to follow them thereon.

New or noteworthy North American Phanerogams.—IX.

By N. L. Britton.

Carex Baileyi Britton, n. sp.

Carex tentaculata var. *gracilis* Boott, Ill. 94. 1860. Not *C. gracilis* R. Br.

Carex lurida var. *gracilis* Bailey, Mem. Torr. Club, **1**: 11. 1889.

After observing this plant over a wide range of territory for several seasons, I have concluded to propose it as a species. I obtained crucial proof of its distinctness from *C. lurida* last autumn by finding the two growing side by side near Lake Placid, N. Y. I think the following description will readily identify it. It affords me much pleasure to associate the name of my friend, Prof. L. H. Bailey, with this very beautiful sedge.

Glabrous, culms erect or reclining, very slender, minutely scabrous above, 1°–2° long. Leaves slightly scabrous, elongated, 1″–2″ wide, the upper and the similar bracts exceeding the culm; staminate spike solitary, short-peduncled; pistillate spikes 1–3, narrowly cylindric, very densely many flowered, all erect or ascending, 9″–2′ long, about 4″ in diameter, the upper sessile, the lower more or less stalked; perigynia inflated, ovoid, 2½″–3″ long, ascending, abruptly contracted into the subulate 2-toothed beak, prominently several-nerved, the lower about equalling, the upper longer than the linear-subulate ciliate-scabrous scale; stigmas 3.

In bogs, Vermont to Pennsylvania, Virginia and Tennessee along the mountains.

Another species has recently been distributed as *C. Baileyi* from the Herbarium of Harvard University, but no description of it has appeared, and I am informed by Dr. B. L. Robinson that it is probably *C. Raeana* Boott, in which conclusion I concur.

Carex Asa-Grayi hispidula (A. Gray) Bailey, Bull. Torr. Club, **20**: 427. 1893.

Carex Grayi var. *hispidula* A. Gray; Bailey, Mem. Torr. Club, **1**: 54. 1889.

The occurrence of trichomes on the perygynia in *Carex*, while a very strong character in some groups, is evidently a poor one in others. In the species under consideration it is so variable that it does not seem to me to warrant the separation of the proposed variety, especially as this does not appear to have other characters nor any well marked distribution as compared with the glabrous plant.

CAREX WALTERIANA Bailey, Bull. Torr. Club, **20**: 429. 1893. This is another species whose perigynia vary from glabrous to quite densely pubescent. Professor Bailey has proposed (loc. cit.) a variety *brevis* for those with glabrous perigynia. I find the pubescence exceedingly variable; it is true, as he remarks, that the northern plants tend to have no pubescence, while the southern ones have a great deal, but I have New Jersey specimens in which the perigynia are hairy at the base and South Carolina specimens whose perigynia are very nearly glabrous. Under these circumstances I see no desirability of separating the northern plant as a variety.

CAREX BULLATA Schk. A form of this species with solitary long-stalked spreading pistillate spikes is collected by Mr. Lighthipe at Sand Hills, Middlesex Co., N. J. It was erroneously recorded in my Catalogue of Plants found in New Jersey as *C. Olneyi*, which, after an examination of several authentic specimens, I refer with confidence to *C. monile.*

CAREX HARTII Dewey Am. Journ. Sci. (II.) **41**: 226. 1866.

Carex retrorsa var. *Hartii* A. Gray, Man. Ed. 5, 600. 1867.

Examination of a considerable suite of specimens convinces me that this is a species distinct from *C. retrorsa.* I append a description:

Glabrous, culms very slender, smooth or very slightly scabrous above, erect or reclining, 1½°–2½° long. Leaves elongated, rough on the margins and lower side of the midvein, 2″–3″ wide, the upper and the similar bracts much overtopping the culm; staminate spikes 1 or 2, the lower sometimes pistillate at the base, borne on a stalk ½′–1′ long; pistillate spikes 2–4, scattered, rather loosely many-flowered, the upper sessile, the lower slender-stalked, 1′–2′ long, about ½′ thick, all erect or ascending; perigynia inflated, ovoid-conic, spreading or the lower somewhat reflexed, prominently few-nerved, about 3″ long, gradually tapering into the long 2-toothed beak, 2–3 times as long as the lanceolate acute or acuminate scale; stigmas 3.

In marshes, Ontario to central New York (and Pennsylvania?) west to Michigan.

CAREX ATRATIFORMIS Britton.

Carex ovata Rudge, Trans. Linn. Soc. 7: 96. *pl. 9.* 1804. Not Burm.

Carex atrata var. *ovata* Boott, Ill. 114. 1892.

This plant appears to me constantly different from the European *C. atrata;* I characterize it is as follows:

Glabrous, culms very slender, erect, sharp-angled, scabrous above, 8′–2° tall, leafy only below. Leaves smooth or but slightly scabrous, 1″–1½″ wide, rarely over 6′ long, much shorter than the culm; spikes 2–5, dense, oblong or oblong-cylindric, 4″–12″ long, about 2½″ in diameter, the terminal one usually staminate at the base and sessile or nearly so, the others filiform-stalked and drooping when mature; lower bracts ½′–1½′ long, very narrow, the upper ones subulate; perigynia flattened, ovate or nearly orbicular, puncticulate, ascending, about 1″ long, tipped with a very short minutely 2-toothed beak; scales reddish-brown, oblong, obtuse or subacute, slightly narrower than and about equalling the perigynia; stigmas 3.

Newfoundland to the mountains of New England, west to the Northwest Territory.

CAREX STRICTA XEROCARPA (S. H. Wright).

Carex xerocarpa S. H. Wright, Am. Journ. Sci. (II.) **42**: 334. 1866.

This appears to me to be a very well marked variety, if not a species distinct from *C. stricta* Lam. The pistillate spikes are almost filiform, loosely flowered and about 1″ in diameter. Besides original specimens collected in central New York by the describer of the species, I have it from Illinois, collected by J. Wolf.

CAREX HAYDENI Dewey, Am. Journ. Sci. (II.) **18**: 103. 1854.

Carex aperta Carey in A. Gray, Man. 547. 1848. Not Boott.

Carex stricta var. *decora* Bailey, Coult. Bot. Gaz. **13**: 85. 1888.

Professor Bailey has shown that the plant referred to *C. aperta* Boott, in the earlier editions of Gray's Manual, is not the same as the species of the Northwest to which the name was originally applied. I am confident that it is specifically distinct from *C. stricta*. I refer it to *C. Haydeni* with hesitation, although examination of an immature authentic specimen indicates that this name may be correctly applied to it. The species may be characterized as follows:

Glabrous, similar to *C. stricta* but smaller, culm slender, scabrous above, seldom over 2° high. Leaves 1″–1½″ wide, rough-margined, shorter than or sometimes overtopping the culm, their sheaths slightly or not at all fibrillose; lower bract foliaceous, about equalling the culm; staminate spikes linear-cylindric, 6″–15″ long, about 2″ in diameter, erect or somewhat spreading, all sessile or nearly so, sometimes with a few staminate flowers at the summit; perigynia orbicular, obtuse, about ½″ broad, faintly 2–4-nerved, minutely beaked, the orifice entire; scales lanceolate, purplish, spreading, very acute, about twice as long as the perigynia; stigmas 2.

In swamps, New Brunswick to Western Ontario, south to Rhode Island, Pennsylvania, Wisconsin and Nebraska.

Carex costata Schwein. Ann. Lyc. N. Y. **1**: 67. 1824. Not Presl, 1819.

Carex virescens var. *costata* Dewey, Am. Journ. Sci. **9**: 260. 1825.

My observations on this plant lead me to believe it constantly different from *C. virescens* Muhl. As the name applied to it by Schweinitz has been used before, I propose for it Carex costellata and give its characters as follows:

Similar to *C. virescens* but taller and more spreading, culms slender, 1°–2½° long. Leaves 1½″–2″ wide, pubescent, especially on the sheaths, shorter than the culm, the upper one and the similar lower bract sometimes overtopping the spikes; spikes 2–5, narrowly cylindric, many-flowered, rather loose, ½′–1½′ long, 1½″ in diameter, erect or slightly spreading, the terminal one staminate below, the lower one commonly filiform-stalked; perigynia oblong, densely pubescent, narrowed at each end, strongly several-ribbed, 1″ long, rather more than ½″ thick, beakless, the orifice entire; scales ovate, scarious-margined, acuminate or cuspidate, shorter than the perigynia; stigmas 3.

In woods, Maine and Ontario to North Carolina, chiefly along the mountains.

Allionia Bushi n. sp. Low, glabrous, somewhat fleshy; stem nearly white, diffusely branched, about 8′ high, the branches slender, widely divergent; leaves narrowly linear, sessile, 1′–3′ long, 1″–1½″ wide, blunt, their width almost uniform from base to apex; involucres clustered at the ends of the branches, at first campanulate and longer than the flowers, at length rotate and becoming 10″ broad, membranaceous, pubescent, finely reticulate-veined, their 3 short lobes semi-circular, rounded, the mid-veins prominent.

In dry ground. Jackson county, Missouri. August, 1893. B. F. Bush.

Resembles *A. Bodini* (Holzinger) Morong, which is much more slender, its involucres short-pedicelled in the axils, the lobes ovate-oblong and acute.

RANUNCULUS ALLEGHENIENSIS n. sp.

Similar in aspect to *R. abortivus* and *R. micranthus*, glabrous, stem widely branched, 1°–2° tall. Radical leaves reniform or suborbicular, 6″–2′ wide, long-petioled, crenate or some of them lobed, the teeth and lobes subacute; stem leaves sessile or the lower petioled, divided nearly or quite to the base into linear acute entire toothed or cleft segments; flowers about 2″ broad; petals oblong, glandular, not exceeding the calyx; head of fruit sub-globose or oblong, 2″ in diameter; receptacle linear, about 2″ long, pubescent; achenes slightly compressed and margined, tipped with subulate hooked or recurved styles of about one-half their length.

Mountains of Virginia and North Carolina. April–May.

BRASSICA JUNCEA (L.) Cosson, Bull. Soc. Bot. France, 6: 609. 1859.

Sinapis juncea L. Sp. Pl. 668. 1753.

Annual, glabrous, somewhat succulent, stem erect, usually stout, 2°–4° tall. Lower leaves runcinate-pinnatifid and dentate, long-petioled, 4′–6′ long, the uppermost sessile or nearly so, lanceolate or linear, commonly entire, much smaller; fruiting racemes sometimes 1° long; pods erect or nearly so on slender ascending pedicels, not appressed to the axis, 1′–2′ long, rather more than 1′ wide, the conic-subulate beak one-fourth to one-third the length of the body.

This plant has been sent to me from a number of points during the past three years and I have collected it twice myself. It seems to be fairly naturalized in some regions. As represented in the specimens examined, it is readily distinguished from *B. Sinapistrum* Boiss. by the total absence of the hispid pubescence of that species and by its erect longer and subulate-beaked pods.

In waste places, Southern New York and Pennsylvania to Michigan and Virginia. Adventive or naturalized from Asia. Also introduced into the West Indies and South America.

CHIMAPHILA Pursh. Additional proof of the non-publication of *Pseva* Raf., as an older name for this genus is to be found in Rafinesque's review of "A Manual of Botany for the Northern

States, compiled by the Editor of Richard's Botanical Dictionary," Albany, 1817. The author of this work is reported to have been Prof. Amos Eaton. Rafinesque's review is printed in the "American Monthly Magazine," 1: 426–430, September, 1817, where among his criticisms he remarks, "He (Eaton) has not adopted the good genera *Chimaphila* Pursh," etc.

Descriptions of new Leaves from the Cretaceous (Dakota Group) of Kansas.*

BY ARTHUR HOLLICK.

(PLATES 236, 237.)

During the past year one of the students † at Columbia College was engaged under my direction in overhauling and naming the Dakota Group material in the Geological Museum, with instructions to put aside all specimens which could not be satisfactorily identified. I take pleasure in saying that the specimens now under consideration were the only ones, except a few fragments not capable of being satisfactory determined, which he found necessary to thus separate; also to state that they apparently represent three species and one variety new to the horizon, and to give him credit for having recognized them as posessing characters different from those of any published plates or descriptions with which they could be compared. All are from the vicinity of Fort Harker, Kans.

SASSAFRAS (ARALIOPSIS) Lesq.

This subdivision of the genus *Sassafras* was made by Lesquereux to contain a number of leaves which might be classed with either *Sassafras* or *Aralia*. Their systematic position is yet problematic, but they are included under the former genus in his posthumous Flora of the Dakota Group, edited by F. H. Knowlton. (Monog. xvii. U. S. G. S., 1891.)

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* Read by title at the meeting of the New York Academy of Sciences, February 11, 1895.

† Mr. Chas. R. Pollard, now Assistant Curator of the National Herbarium.

SASSAFRAS (ARALIOPSIS) DISSECTUM SYMMETRICUM n. var.

(Plate 236.)

Differs from *S.* (*A.*) *dissectum* Lesq. Cret. & Tert. Fl. 57; Fl. Dak. Gr. 101. *pl. 14. f. 1*, in its symmetrical branching, especially that of the lateral primaries, which start from the base of the leaf exactly opposite to one another and fork at an equal distance above; also in the fact that the blade of the leaf is not decurrent along the petiole, but ends at the point where the lateral primaries branch from the midrib.

I was at first inclined to describe this as a new species, but the imperfect condition of the upper portion of the specimen seemed to render this inadvisable, and its substantial agreement in essential particulars with *S.* (*A.*) *dissectum* decided me to class it as a variety of that species.

CISSITES HEER.

This genus was founded by Heer, to include leaves presumably allied to *Cissus*, but subsequently made by other authors to include leaves having more or less resemblance to *Vitis*, *Platanus*, *Sassafras*, etc.

CISSITES PLATANOIDEA n. sp.

(Plate 237. f. 2.)

Leaf symmetrical, 2¾ in. long by 2¾ in. broad, sub-orbicular to fan-shaped in outline, abruptly decurrent at base, obscurely 3-lobed; margin undulate or obscurely dentate; nervation 3-palmate, craspedodrome; midrib abruptly thickened below the point where the lateral primaries branch off, also to a lesser extent below the point where the upper secondaries branch off; secondaries clustered together in two pairs above the middle of the midrib, the upper pair extending to the margins, the lower pair merging gradually into the tertiary nervation, of which it may perhaps be considered to form a part; the latter forming polygonal meshes, well defined; lateral primaries branched mostly from below, obscurely from above near the extremities and abruptly thickened below the point where the first secondaries branch off.

This leaf is suggestive of species which have been described under the genera *Sassafras* (*S. obtusum* Lesq., etc.,) *Platanus* (*P. Heerii* Lesq., *P. obtusiloba* Lesq., etc.), *Cissites* (*C. ingens* Lesq., etc.), and *Parrotia* (*P. Canfieldi* Lesq.), but is clearly distinct from any of these, and rather than erect a new genus I have decided to class it with *Cissites* and to indicate other characteristics in the specific name.

CISSITES ACUTILOBA n. sp.

(Plate 237. f. 3.)

Leaf 2¾ in. long by 2⅜ in. broad, sub-orbicular in outline, three lobed, lobes acute; nervation 3-palmate; lateral primaries long, almost equalling the midrib, somewhat incurved, margin entire.

Differs from *C. Harkerianus* Lesq., with which it is closely allied, in its more rounded outline, longer lateral primaries and acute lobes and apex.

PROTOPHYLLUM Lesq.

This genus was founded by Lesquereux to include certain leaves of an apparently synthetic type, some of which had been described under the genera *Credneria* and *Pterospermites*. The systematic position of the genus cannot yet be said to be definitely determined, although in Fl. Dak. Gr. *l. c.* it is classed in the Sterculiaceae. Whatever its systematic position may be there is no doubt that our species belongs to the genus as defined.

PROTOPHYLLUM QUERCIFORME n. sp.

(Plate 237, f. 1.)

Leaf 3½ in. long by almost 3½ broad at middle, rhombic-ovate in outline, rounded above, more or less abruptly narrowed from middle to base, slightly acuminate at apex; margin undulate-dentate; nervation craspedodrome; lower secondaries relatively slender, crowded together, branching from the midrib at an obtuse angle; median ones stronger, more distant, branching from the midrib at a more acute angle, forked two-three times; upper ones again slender and branching as before at a more obtuse angle; tertiary nervation uniform, slightly curved outward, simple, fine, and at right angles to the secondaries throughout.

This leaf somewhat resembles *P. Haydenii* Lesq., but differs in its smaller size, narrowed base and more rounded apex. The superficial appearance suggests one of our broad leaved oaks, as I have indicated in the specific name.

In conclusion I wish to acknowledge my indebtedness to Dr. F. H. Knowlton of the United States Geological Survey for criticisms and references in nomenclature and synonomy.

A Preliminary List of the North American Species of Malpighiaceae and Zygophyllaceae.

By Anna Murray Vail.

MALPIGHIACEAE.

1. JANUSIA A. Juss. Monog. Malp. 349. *pl. 21.* 1843.

Janusia gracilis A. Gray, Pl. Wright. **1**: 37. 1852.

Distr. Arizona, New Mexico, Texas and Mexico.

2. ASPICARPA Rich. in Mem. Mus. Par. **2**: 398. *pl. 1.* 1815.

1. Aspicarpa hyssopifolia A. Gray, Bost. Journ. Nat. Hist. **6**: 167. 1850.

Distr. Texas, New Mexico and North Mexico.

2. Aspicarpa longipes A. Gray, Pl. Wright. **1**: 37. 1852.

Distr. Texas, New Mexico, southern Arizona and North Mexico.

Very close to *A. humilis* (Benth.), from which it differs mainly in its trailing, and decumbent habit and somewhat larger leaves.*

3. THRYALLIS L. Sp. Pl. Ed. 2, 554. 1763. Not *Thryallis* Mart. Nov. Gen. **3**: 77. *pl. 230, 231.* 1829.

Thryallis angustifolia (Benth.) Kuntze, Rev. Gen. Pl. 89. 1891.

Galphimia angustifolia Benth. Bot. Sulph. 9. 1844.

Galphimia linifolia A. Gray, Bost. Journ. Nat. Hist. **6**: 166. 1850.

Distr. Western Texas to New Mexico, Lower California and Mexico.

Very variable. The broader leaved form is

Thryallis angustifolia oblongifolia. (A. Gray.)

Galphimia linifolia β *oblongifolia* A. Gray, Pl. Wright. **1**: 36 1852. It is found with the type and may possibly be a species.

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* *Aspicarpa Hartwegiana* A. Juss. Arch. Mus. Par. **3**: 598. 1843, is a synonym of *Gaudichaudia humilis* Benth. Pl. Hartw. 6. 1839, *fide* Kew Index.

4. MALPIGIA L. Sp. Pl. 425. 1753.

MALPIGIA GLABRA L. Sp. Pl. 425. 1753.

Malpigia nitida Mill. Gardn. Dict. Ed. 8: No. 5. 1768.

DISTR. Texas, Mexico, West Indies and South America.

5. BYRSONIMA Rich. & Juss. Ann. Mus. Par. **18**: 481. 1811.

BYRSONIMA LUCIDA (Sw.) H. B. K. Nov. Gen. **5**: 147. 1821.

Malphigia lucida Sw. Fl. Ind. Occ. 852. 1800.

DISTR. South Florida and West Indies.

ZYGOPHYLLACEAE.

1. FAGONIA L. Sp. Pl. 386. 1753.

* FAGONIA CALIFORNICA Benth. Bot. Sulph. 10. 1844.

DISTR. California, North and South Mexico.

2. GUAJACUM L. Sp. Pl. 381. 1753.

GUAJACUM SANCTUM L. Sp. Pl. 382. 1753.

Guajacum verticale Ortega, Dec. **8**: 93. 1800.

Guajacum Sanctum var. *parvifolium* Nutt. Sylva, **3**: 17. 1849.

DISTR. South Florida, Bahamas, San Domingo, Porto Rico, etc.

3. PORLIERIA Ruiz & Pav. Prod. 55. *pl. 9.* 1794.

PORLIERIA ANGUSTIFOLIA (Engelm.) A. Gray, Pl. Wright. **1**: 28. 1852.

Guajacum angustifolium Engelm. Wisliz. Rep. 29. 1848.

DISTR. Texas and North Mexico.

4. COVILLEA.†

Larrea Cav. in Ann. Hist. Nat. **2**: 119. *pl. 18, 19.* 1800. Not *Larrea* Orteg. Hort. Matr. Dec. 15. *pl. 2.* 1797.

COVILLEA DIVARICATA (Cav.).

Larrea divaricata Cav. Ann. Hist. Nat. **2**: 122. 1800.

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* FAGONIA CALIFORNICA GLUTINOSA n. var.

Somewhat stouter, the leaflets larger, the terminal one sub-rhomboid, the whole plant beset with sub-sessile, aromatic, gold-colored glands.

Sonora, Mexico, Pringle (1884); Los Angeles Bay, Lower California, Palmer No. 546 (1887); Sta. Rosalia Island, Palmer, Lower California (1890).

The above name appears on a sheet of Mr. Pringle's collection in Herb. Columbia College, and I have not been able to find any printed reference to it.

† Named in honor of Frederick Vernon Coville.

Zygophyllum tridentatum DC. Prodr. **1**: 706. 1824.

Larrea Mexicana Moric. Pl. Nouv. Am. 71. *pl. 48.* 1833–1846.

Larrea glutinosa Engelm. Wisliz. Rep. 9. 1848.

DISTR. Southern Utah, Nevada, Arizona, Texas, New Mexico, Mexico and in the deserts of Chili.

Careful examination does not reveal any characters that warrant keeping the Mexican species distinct from the South American. The principal differences were found in the stamineal scale. The latter is a very variable organ, and three or four variations were found, not only on the same plant, but in the same flower.*

5. TRIBULUS L. Sp. Pl. 386. 1753.

1. TRIBULUS CISTOIDES L. Sp. Pl. 387. 1753.
   DISTR. Florida, Texas, Mexico, Lower California, West Indies and tropical America.
2. TRIBULUS TERRESTRIS L. Sp. Pl. 387. 1753.
   DISTR. Ballast Grounds, Hunter's Point, Long Island, N. Y.; South Carolina, Mexico and Brazil. A native of Southern Europe, East Indies, etc.

6. KALLSTROEMIA Scop. Introd. 212. 1777.

1. KALLSTROEMIA CALIFORNICA (S. Wats.)
   Tribulus Californicus S. Wats. Proc. Amer. Acad. **11**: 125. 1876.
   DISTR. Arizona, North Mexico and Lower California.
2. KALLSTROEMIA GRANDIFLORA Torrey; A. Gray, Pl. Wright. **1**: 28. 1852.

   Kallstroemia grandiflora var. *detonsa* A. Gray, Pl. Wright. **1**: 28. 1852.

   Tribulus grandiflorus Benth. & Hook. Gen. Pl. 1: 264. 1862–67.

   DISTR. Texas, Arizona, New Mexico, California, North and South Mexico, Guatemala.
3. KALLSTROEMIA MAXIMA (L.) T. & G. Fl. N. A. **1**: 213. 1838.
   Tribulus maximus L. Sp. Pl. 386. 1753.
   Tribulus trijugatus Nutt. Gen. **1**: 277. 1818.

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* The other species are *Covillea nitida* (Cav.) and *Covillea cuneifolia* (Cav.), both from South America, and described under *Larrea* in Cav. Icon. **6**: 40–41. *pl. 559, 560.* 1801.

Tribulus decolor Macfadyen, Fl. Jamaic. 186. 1837.

DISTR. Kansas, Arizona, Texas, New Mexico, Florida, Mexico, and common in tropical and sub-tropical America to Brazil.

7. PEGANUM L. Sp. Pl. 444. 1753.

PEGANUM MEXICANUM A. Gray, Pl. Wright. 1: 30. 1852. 2: 106. 1853.

DISTR. New Mexico and Mexico.

The Genus Zenobia Don.

In 1834 David Don published "A New Arrangement of the Ericaceae,"* in which he separated a number of species from the large Linnaean genus *Andromeda*, creating at the same time several new genera in which the detached species were included. Of these additions, *Cassandra* (now *Chamaedaphne*), *Cassiope* and *Leucothoe* have long been recognized as distinct; but *Zenobia*, although it was taken up by Bentham and Hooker,† has been considered by Gray and later botanists only a subgenus of *Andromeda*. I here propose to restore it to its original rank, thus preserving the arrangement of Don and of Hooker.

ZENOBIA Don.

Calyx free, 5-lobed; corolla campanulate with 5 rounded lobes; stamens 10, on short basally dilated filaments; anther-cells elongated, 2-awned; stigma simple; capsule depressed-globose, 5-angled, loculicidally 5-valved, many-seeded; seeds oval, with a spongy testa and fleshy albumen. Smooth or glaucous shrubs with somewhat coriaceous strongly reticulated leaves, and white flowers disposed in axillary fascicles.

ZENOBIA CASSINEFOLIA (Vent.).

Andromeda cassinefolia Vent. Hort. Cels. 1: 60. 1800.

Andromeda nitida Sims, Bot. Mag. *pl. 970*. 1803. Not Bartr.

Andromeda speciosa Michx. Fl. Bor. Am. 1: 256. 1803.

Fruticose, glabrous throughout; leaves coriaceous, oblong-ovate, acuminate, irregularly serrate, the earlier obtuse, the later acute, length 5 cm., width 2.5 to 3 cm.: flowers in naked umbelliform fascicles; corolla not deeply 5-lobed, 6 to 8 mm. long; calyx spreading, its lobes acutely triangular.

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* Edinb. N. Phil. Journ. 17: 158. 1834.

† Genera Plantarum, 2: 587. 1873.

North Carolina to Florida.

ZENOBIA PULVERULENTA (Willd).

Andromeda pulverulenta Willd. Sp. Pl. **2**: 610. 1799. Bartr. Trav. N. & S. Car. Georg. *pl. 474*. 1799, without synonymy or description.

Andromeda speciosa var. *pulverulenta* Michx. Fl. Bor. Am. **1**: 256. 1803.

Fruticose, glabrous and prominently glaucous throughout; leaves subcoriaceous, elliptical, entire or obscurely serrulate, slightly cuspidate, acute when young, becoming obtuse; length 5.5 to 6 cm., width 2.5 to 3 cm.; calyx somewhat campanulate, its lobes closely appressed to the corolla, and with the peduncle glauco-pulverulent; corolla with lobes more acute than in *cassinefolia*.

Same range as the last, but less common.

This species was figured by Bartram,* who evidently considered it worthy of something more than varietal rank, although he did not describe it. Michaux placed it under his *Andromeda speciosa*, and his example was followed by Pursh,† who remarks in a note on *speciosa*: "I certainly must coincide with Michaux's idea of A. pulverulenta being only a variety, as I very frequently have seen intermediate varieties and even had the trace of both on one plant."

While it is true that *Z. pulverulenta* exhibits a variable degree of glaucosity, there are other characters which, on careful examintion, serve to separate it from *cassinefolia*. The calyx in the one case is campanulate, in the other spreading, with smaller lobes, the leaves are elliptical, and not oblong-ovate; and the peduncles in *pulverulenta* are always prominently glauco-pulverulent, giving the plant a very distinctive appearance. It is also possible that the two species may hybridize, as they occur throughout the same range, and this would explain the various forms which Pursh claims to have seen on the same plant.

CHARLES LOUIS POLLARD.

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* Trav. N. & S. Car. and Georg. l. c.

† Fl. Am. Sept. **2**: 294. 1814.

Botanical Notes.

Nomenclatural.—A document has recently been issued from the herbarium of Harvard University, accompanied by a letter signed by the curator of that establishment, objecting to the system of nomenclature adopted almost unanimously by the botanists of the American Association for the Advancement of Science at meetings held in Rochester, N. Y., 1892; Madison, Wis., 1893, and Brooklyn, N. Y., 1894, and recommending certain rules as substitutes. It seems desirable that this document be brought before our botanists for their kindly consideration.

The principles, or it may be better expressed, lack of principles, which are here favored have, as a matter of fact, been most seriously considered by the American Association botanists for more than five years, and every one of them has been carefully weighed and found wanting in its application to a stable system of nomenclature. The proposed rules have, indeed, been framed to support what has recently been fittingly termed the "discredited" plan of nomenclature. Still it may be assumed that they will receive a certain amount of support from plant collectors and physiologists, at least until more books shall have been issued based on the rules which have been proven by long trial in other branches of biological science to give nomenclature the stability which is so necessary. The way for these has been paved by that magnificent work, the "Silva of North America," the most exhaustive and elegant botanical publication yet produced in our country; by several State and local floras; and by other papers too numerous to mention. The want of easily accessible descriptive floras, written on this very practical system approved by the botanists of the American Association, is the only circumstance which retards its still wider adoption. There is every reason to believe that these will soon be supplied.

Proceedings of the Club.

TUESDAY EVENING, APRIL 9TH, 1894.

Vice President Lighthope presided and there were 27 persons present.

The following persons were elected active members: Miss Alice M. Isaacs, Prof. E. S. Burgess, Miss Francis M. Chapin, Mr. John Dallas, Mr. Carl D. Schaeffer, Miss Adelaide Porter, Miss S. LeB. Drumm, Mr. Wm. C. Alpers, Miss Helen Parish, Miss Mabel Choate and Mrs. Hamilton Kean.

Mr. Small, for the committee appointed to draft resolutions upon the death of Mr. Redfield, presented a report and submitted resolutions. The report was accepted and the resolutions adopted. [The resolutions were printed with Mr. Canby's biographical sketch of Mr. Redfield in the April BULLETIN.]

The announced paper of the evening, entitled "*Vallisneria spiralis*," was then read by Miss Effie A. Southworth. The paper consisted of an exhaustive review of the literature of this subject, some contradictory statements by different authors being contrasted, followed by an account of the work which had been done by Miss Southworth looking toward an explanation of such discrepancies, and the contribution of additional facts to our knowledge of this plant.

WEDNESDAY EVENING, APRIL 24TH, 1895.

Vice-President Allen in the chair and 29 persons present.

Mr. John G. Block and Mr. John H. Stottler were elected active members.

Dr. Britton exhibited specimens of last year's growth of *Conopholis Americana*, found by Mr. Stottler on Staten Island, where it was apparently parasitical on an oak. He stated that several hundred plants were growing in this locality, comprising a patch about 10 feet square. Mr. Lighthipe reported two collections of this plant in the vicinity of Woodbridge, N. J., and was able to state that in one of the places there were only a few isolated plants. Dr. Rusby had collected the plant a number of times, but had always found but a few plants growing in one locality. He had also noticed this peculiarity in the case of *C. Mexicana.* Mr. Van Sickle had found a patch of about 50 specimens growing upon the top of the Palisades.

Dr. Britton called attention the 6th volume of Hough's Wood Sections, which was now ready for distribution and to the publication of Mr. Small's monograph on *Polygonum* and exhibited copies of both.

The announced paper of the evening was then read by Mr. H. A. Siebrecht, entitled "Some Interesting Orchids of Cultivation." The paper was handsomely illustrated with living specimens in bloom. The paper dealt with the history of the earliest collections and collectors of orchids, and traced the development of their cultivation up to the present time. Interesting facts concerning their native habits and the best methods of growing the different classes were presented, and a discussion concerning their special habits of growth and fertilization was introduced.

Index to recent Literature relating to American Botany.

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Atkinson, G. F. Preliminary Note on the Swarm-spores of *Pythium* and *Ceratiomyxa.* Bot. Gaz. **19**: 375–378. 1894.

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Treats largely of apple scab, with colored plate.

Bailey, W. W. George Hunt. Bot. Gaz. **20**: 176, 177. 20 Ap. 1895.

Bastin, E. S. Structure of *Epigaea repens*. Am. Journ. Pharm. **67**: 231–236. *f. 1–3.* My. 1895.

Bolley, H. L. Distribution of Weed Seeds by Winter Winds. Bull. N. Dak. Exp. Sta. **17**: 102–105. Mr. 1895.

Bolley, H. L. Effect of Seed Exchange upon Culture of Wheat. Bull. N. Dak. Exp. Sta. **17**: 85–102. Mr. 1895.

Blodgett, F. H. On the Development of the Bulb of the Adder's-tongue. Bot. Gaz. **20**: 172–175. *pl. 14.* 20 Ap. 1895.

Boyer, C. S. A fossil marine Diatomaceous Deposit at St. Augustine, Florida. Bull. Torr. Bot. Club, **22**: 171–174. 18 Ap. 1895.

Britton, N. L. The Systematic Botany of North America. Bot. Gaz. **20**: 177–179. 20 Ap. 1895.

Announcement of assignments of groups to monographers.

Canby, W. M. John H. Redfield. Bull. Torr. Bot. Club, **22**: 162–171. 18 Ap. 1895.

Sketch of life, with bibliography and portrait.

Chodat, R. Polygalaceae novae vel parum cognitae. Bull. Herb. Boiss. **3**: 121–135. Mr. 1895.

Five new species of *Polygala* and fourteen of *Monnina* from Central and South America are described.

Coville, F. V. A Reply to Dr. Robinson's Criticism of the "List of Pteridophyta and Spermatophyta of Northeastern America." Bot. Gaz. **20**: 162–167. 20 Ap. 1895.

Coville, F. V. Report of the Botanist U. S. Department of Agriculture for 1893. Rep. Sec. Agric. **1893**: 235–244. 1894.

Deane, W. Notes from my Herbarium. II. Bot. Gaz. **20**: 150–154. 20 Ap. 1895.

Eastwood, A. Two Species of *Aquilegia* from the Upper Sonoran Zone of Colorado and Utah. Proc. Cal. Acad. Sci. II. **4**: 559–562. *pl. 18, 19.* 19 Mr. 1895.

Aquilegia micrantha n. sp. and *A. ecalcarata* Eastwood are illustrated and described.

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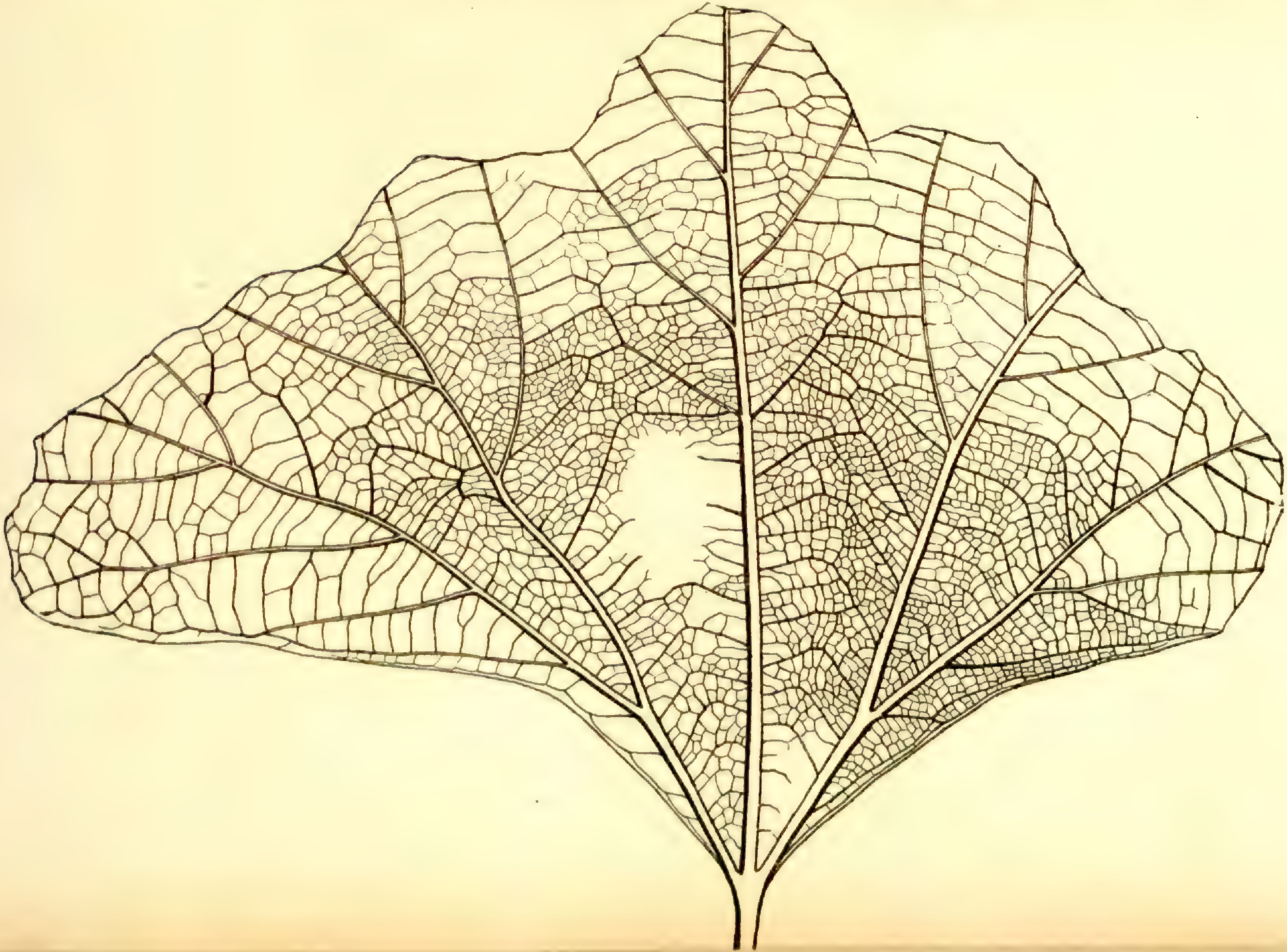

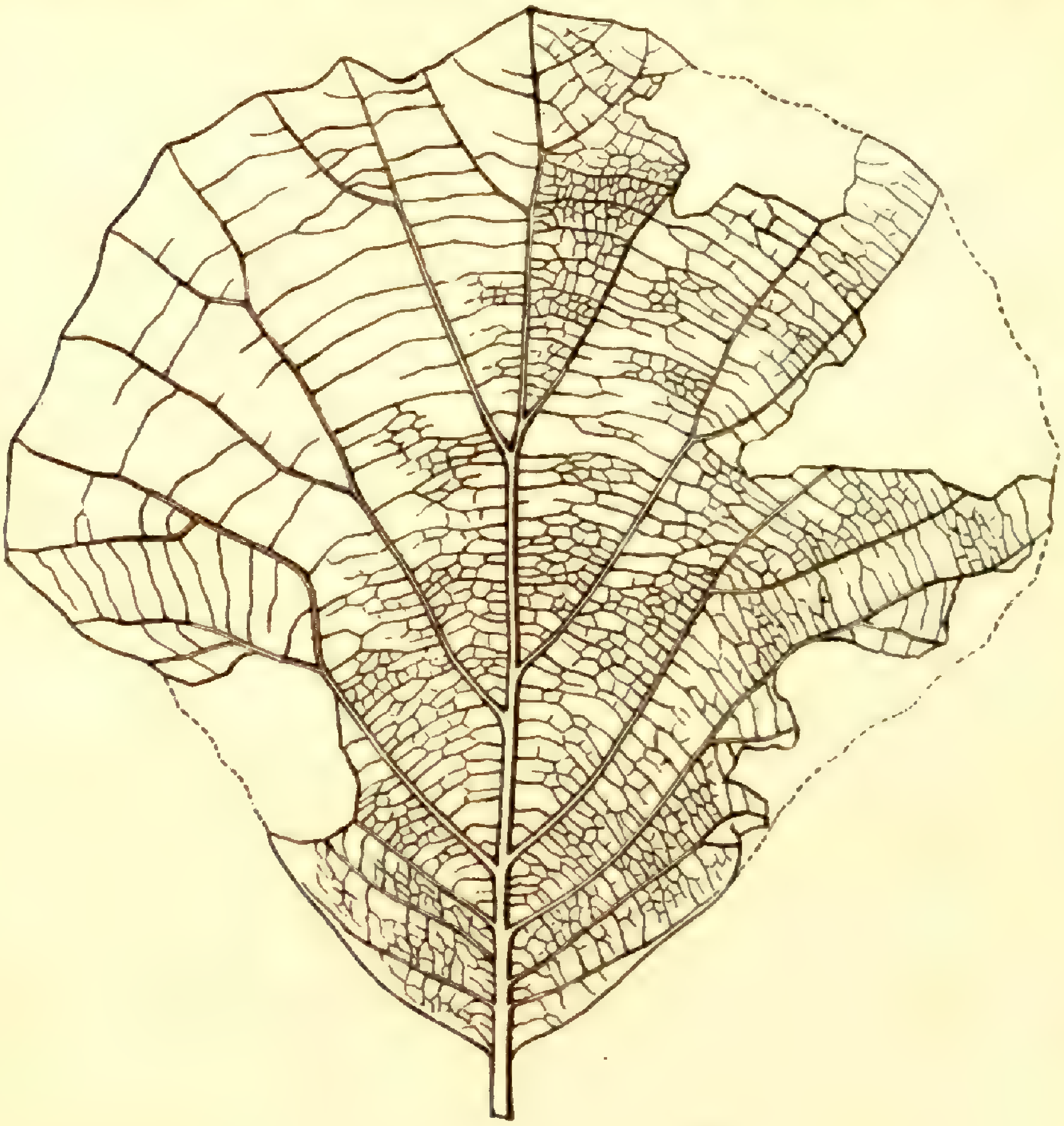

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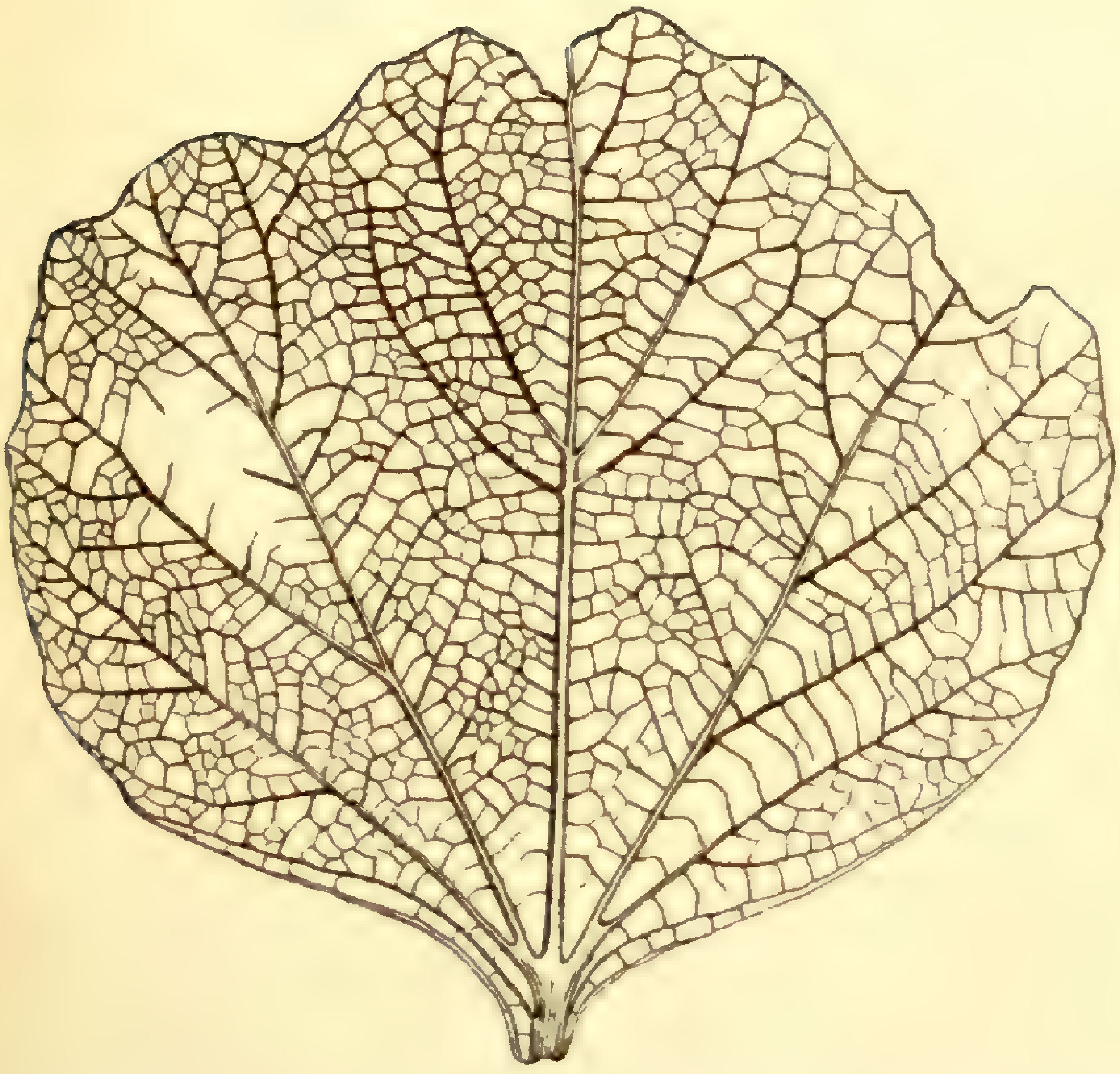

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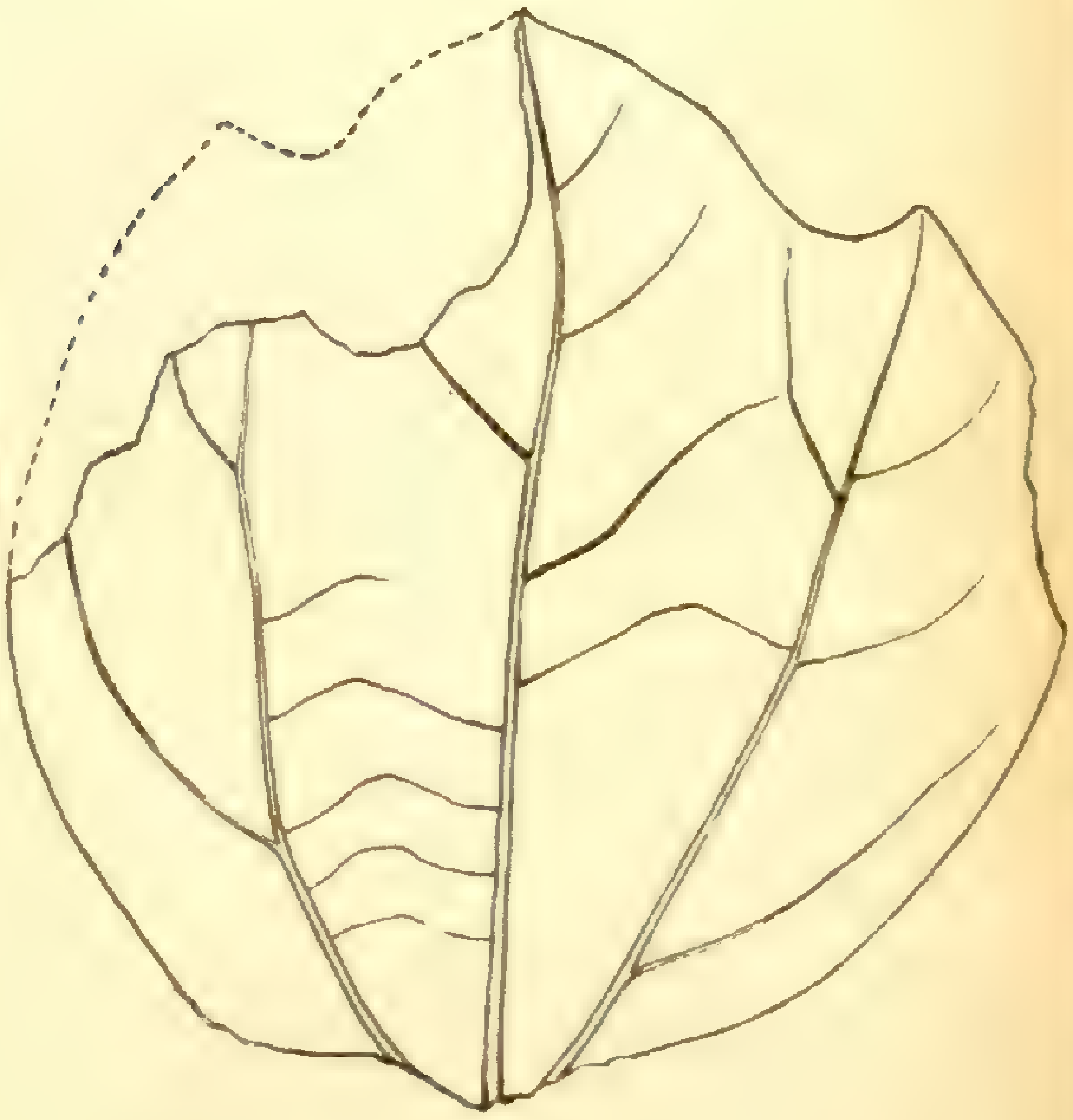

3

FIG. 1. PROTOPHYLLUM QUERCIFORME HOLLICK.
FIG. 2. CISSITES PLATANOIDEA HOLLICK.
FIG. 3. CISSITES ACUTILOBA HOLLICK.

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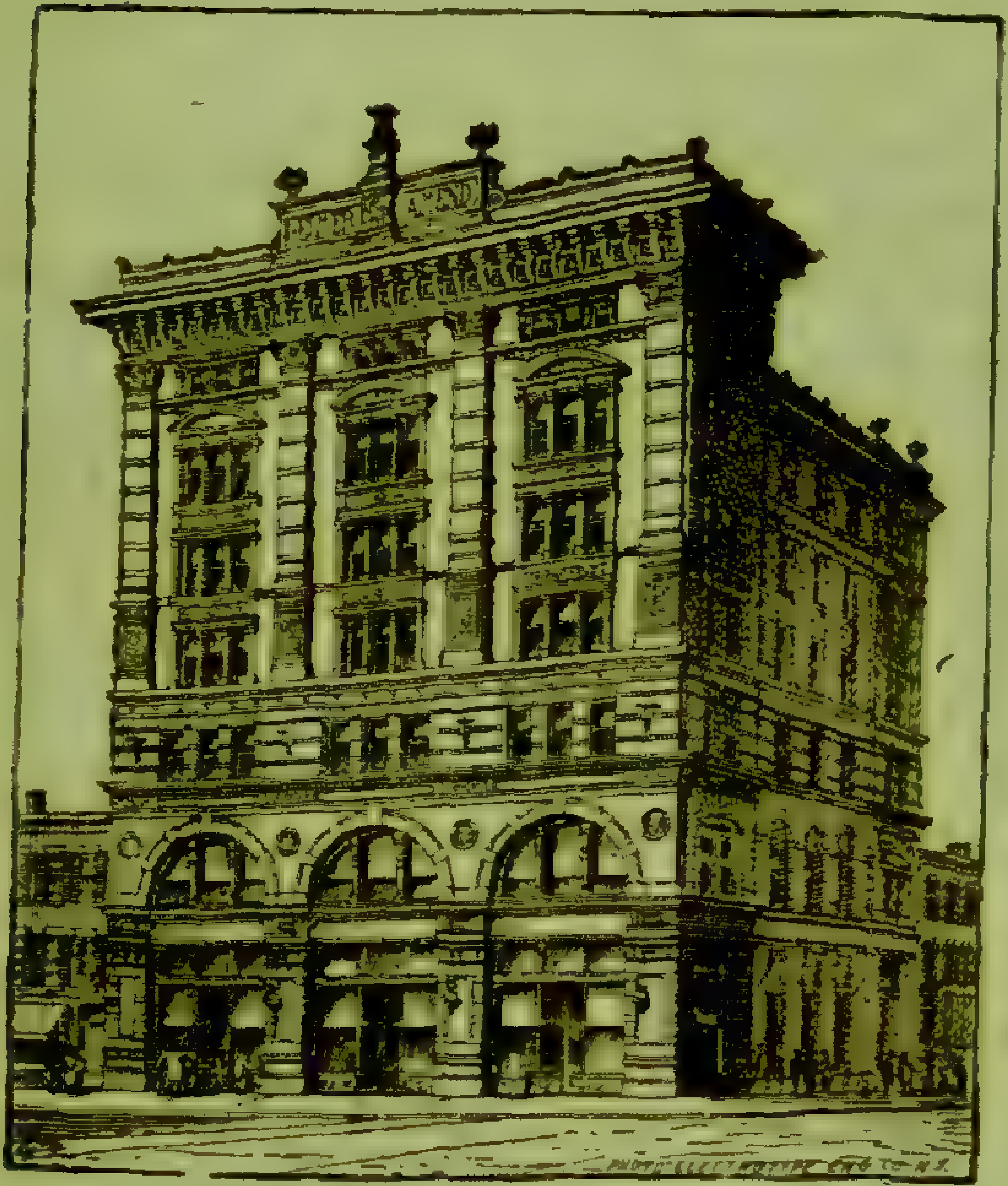

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(*3*) The Preliminary Catalogue of Anthophyta and Pteridophyta reported growing within one hundred miles of New York, 1888. Price, $1.00.

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BULLETIN

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TORREY BOTANICAL CLUB.

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AND OTHER MEMBERS OF THE CLUB.

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MEMBERS OF THE CLUB will please remit their annual dues for 1895, now payable, to Mr. Henry Ogden, Treasurer, 11 Pine St., New York City.

BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 22. Lancaster, Pa., June 25, 1895. No. 6.

An Enumeration of the Lichens of Newfoundland and Labrador.

By John W. Eckfeldt.

The purpose of this paper is to present as full a list of all authenticated lichens that are to be found in the much unexplored regions of Newfoundland and Labrador, as has been afforded during a number of years' sojourn in these lands. The entire field of exploration has been the work of the untiring Rev. A. C. Waghorne, who has been located there through parochial work, and during such residence has endeavored to secure all such plants as it has been possible for him to obtain. The labor has been attended with many difficulties; the inconveniences for traveling, the character of the climate, and the ruggedness of the country have hindered and delayed him in his efforts. The general character of these plants may be regarded as sub-arctic; many, however, are strictly more boreal in distribution, while others are of more southern climes. The determination of these plants has been attended with some difficulty, owing to the great tendency to variation, depending in part on the nature of the climate, and the character of the substratum. The entire work has been subject to my supervision, and a number of the more difficult species, as well as some new types (particularly in the Lecanorei and Lecidacei), have been under the kind observation of Dr. F. Arnold, of Munich, and Dr. J. Hulting, of Norrkoping. A few species are regarded as new and these will be described. The list embraces a large number of types common to both hemispheres.

Most of the lichens of Newfoundland and Labrador were collected from the following localities: Trinity Bay, on the southeastern coast; others from Notre Dame Bay, and a few from White Bay, further north from Placentia Bay to the Labrador. On the Labrador the collection was principally made in the Straits of Belle Isle, then along the coast from Battle Harbor north to Seal Islands, and thence about Sandwich and Gross waters to Hamilton Inlet.

RAMALINA Ach.

R. calicaris (L.) Fr.
  Var. *canaliculata* Fr.
  Var. *farinacea* Schaer.
R. intermedia Del.

Thallus whitish, pale straw color and glaucescent, erect, dichotomously branched, divided and the apices attenuated and divided with frequent soredia on the edges, the cortical layer more filamentous. Apothecia terminal, subtended by elongated forked extremities of the lacinia, pale yellow. Spores hyaline, ellipsoid uniseptate.

R. rigida (Pers.) Tuck.
R. pusilla Prev.
  Var. *geniculata* Tuck.
R. minuscula Nyl. (*Alectoria minuscula* Nyl.)

Thallus densely entangled, small and quite scabrous, apothecia not seen in our specimens. A plant closely allied to *R. pusilla* Prev. from which it distinctly differs.

R. polymorpha Ach.
R. pollinaria Ach.
R. pollinariella Nyl.

Thallus small and finely divided, mostly sorediferous, erect, pale straw color. Plants generally sterile. *R. minuscula. f. pollinariella* Nyl.

CETRARIA Ach.

C. muricata Ach.

Thallus smaller than in the following species, more densely intricate and caespitose, compactly ramulose, terete to subterete, and frequently compressed, smooth, shortly branched, the branches becoming spinulose at the apices.

C. aculeata Ach.
C. Richardsonii Tuck.

- *C. arctica* Hook.
- *C. odontella* Ach.
- *C. Fendleri* Tuck.
- *C. commixta* Nyl.

Thallus clear bright brown to fuscescent, smooth, irregularly laciniate, divided; laciniae erect, much entangled, plane, the margins not elevated, apices obliquely furcate, uniform in color, beneath paler; apothecia reddish brown, disk rugose, margin granulose; spores simple, hyaline, oblong, $\frac{9-11}{4-5}$ mic.

- *C. Fahlunensis* (L.) Schr.
- *C. Islandica* (L.) Ach.
  - Var. *crispa* Ach.
  - Var. *Delisaei* Borr. (*C. hiascens* Th. Fr.)
- *C. ciliaris* Ach.
- *C. lacunosa* Ach.
- *C. nivalis* Bell.
- *C. aureus* Tuck.
- *C. glauca* (L.) Ach.
  - Var. *fusca* Fl. Thallus brown and dark.
- *C. juniperina* L.
  - Var. *Pinastri* Ach.
  - Var. *terrestris* Schr.
- *C. saepincola* Ehrh.
- *C. saepincola* var. *chlorophylla* Wahl.

Evernia Ach.

- *E. prunastri* (L.) Ach.

Usnea Ach.

- *U. barbata* (L.) Fr.
  - Var. *ceratina* Schr.
  - Var. *hirta* Fr.
  - F. *strigosa* Ach.
  - Var. *florida* Fr.
  - F. *glabrescens* Nyl.
  - Var. *dasypoga* Fr.
  - Var. *plicata* Fr.
- *U. longissima* Ach.
- *U. trichodea* Ach.
- *U. cavernosa* Tuck.

ALECTORIA Ach.

A. divergens (Ach.) Nyl.

A. jubata L.

Var. *implexa* Fr.

Var. *chalybeiformis* Ach.

Var. *bicolor* Fr.

Var. *prolixa* Ach.

A. capillaris (Ach.) Nyl. (*A. jubata* var. *cana* Ach.)

Thallus pale, hoary to yellowish-rufescent, much elongated and frequently branched; branches flaccid, densely entangled and somewhat compressed, angular, lacunose beneath; apothecia unknown.

A. ochroleuca (Ehrh.) Nyl.

Var. *rigida* Fr.

Var. *osteina* Nyl.

Var. *nigricans* Ach. (*A. nigricans* Nyl.)

Var. *circinata* Fr.

Var. *sarmentosa* Nyl.

THELOSCHISTES Norm.

T. chrysopthalmus (L.) Norm.

T. parietinus (L.) Norm.

Var. *aureola* Ach.

Thallus brighter yellow to orange, rounded, lobate, sinuately incised, thicker, crenate, the margins erect, granulate; apothecia sub-crenate.

T. lychneus Nyl.

T. polycarpus Ehrh.

Var. *pygmaeus* Fr.

T. concolor Dicks. (*Xanthoria candelaria* Nyl.)

PARMELIA Ach.

P. aurulenta Tuck.

P. tiliacea (Hoff.) Flk.

Var. *sublaevigata* Nyl.

P. cetrata Ach.

P. Borreri Turn.

Var. *rudecta* Tuck.

P. saxatilis (L.) Fr.

P. saxatilis var. *panniformis* (Ach.) Schr.

P. saxatilis var. *sulcata* Nyl.

P. saxatilis f. *furfurascens* Schr. Thallus very furfuraceous.

P. saxatilis var. *omphaloides* Fr.

P. fraudans Nyl.

This has been regarded as a subspecies of *P. saxatilis* and frequently taken for that species, but has distinctions worthy of specific rank.

P. physodes (L.) Ach.

Var. *vittata* (L.) Ach.

Var. *enteromorpha* Tuck.

Var. *obscurata* Ach.

P. encausta (Sm.) Nyl.

P. encausta var. *alpicola* Nyl.

P. colpodes (Ach.) Nyl.

P. olivacea (L.) Ach.

P. olivacea var. *aspidota* Ach.

P. olivacea var. *panniformis* Nyl.

P. olivacea var. *sorediata* (Ach.) Nyl.

P. lanata (L.) Wallr.

P. stygia (L.) Ach.

P. conspersa (Ehrh.) Ach.

P. leucochlora Tuck.

P. centrifuga (L.) Ach.

P. incurva (Pers.) Fr.

P. ambigua (Wulf.) Ach.

Var. *albescens* Wahl. (*P. hyperopta* Ach.).

PHYSCIA DC.

P. hypoleuca (Mull.) Tuck.

P. comosa Esch. (*P. galactophylla* Willd).

P. leucomela (L.) Michx.

P. ciliaris (L.) D. C.

P. ciliaris var. *crinalis* Schr.

P. aquila var. *detonsa* Tuck.

P. pulverulenta (Schreb.) Nyl.

P. pulverulenta var. *leucoleiptes* Tuck.

P. pulverulenta f. *muscigena* Auct.

P. stellaris L.
P. stelloris f. *adscendens* Fr.
P. astroidea (Fr.) Nyl.
P. tribacia (Ach.) Tuck. (*P. erosa* Borr.)
P. hispida Schreb. (*P. tenella* Ach.)
P. crispa (Bers.) Nyl.
P. caesia (Esch.) Nyl.
P. obscura (Ehsh.) Nyl.
  Var. *endochrysea* Nyl.

UMBILICARIA Hoff.

U. rugifera Nyl.
U. cylindrica (L.) Del.
U. proboscidea (L.) Sten.
U. arctica Ach. (*U. proboscidea* v. *arctica* (Ach.) Tuck.)
U. anthracina (Wulf.) Schr.
U. polyphylla (L.) Hoff.
U. flocculosa Hoff.
U. hyperborea Hoff.
U. erosa (Web.) Hoff.
U. Muhlenbergii (Ach.) Tuck.
U. hirsuta (Ach.) Sten.
  Var. *grisea* Th. Fr.
U. vellea (L.) Nyl.
U. Pennsylvanica Hoff.
U. spodochroa Ehrh.

Thallus varying from moderately large and irregular to small and orbicular, thin, flattish and spreading, with an irregular waving crenate margin in the smaller forms, pale ashy to light purplish brown in older specimens, paler at the centre and mealy; beneath brown and minutely granulose and thickly covered with irregular stout brownish fibrils; apothecia very numerous, sessile and scattered towards the border, elevated, stout and robust, orbicular, disk prominent, rounded and conspicuously papuloid, surrounded by a thick, even or fissured margin, smooth, black; spores ellipsoid, simple, $\frac{16-23}{8-14}$ mic.

The occurrence of this Scandinavian lichen in this country is rather remarkable.

U. pustulata (L.) Hoff.
  Var. *papulosa* Tuck.

U. LABRADORENSE Hulting n. var.

Thallus thinner than the preceeding, small, from ash color becoming olivaceous or brown, rugulose, papulose, papules scattered, remotely prominent, beneath finely granular, foveolate, foveoli small, contracted, sanguineous within; apothecia reddish-brown, orbicular with a well raised margin 1–2 mm. broad; spores large, orbicular $\frac{80}{45}$ mic. On rocks associated with the preceding variety. Labrador.

STICTA Schreb.

S. amplissima (Scop.) Mass.
S. herbacea (Huds.) Ach.
S. pulmonaria (L.) Ach.
S. querizans (Michx.) Ach.
S. limbata (Sm.) Ach.; evidently quite new to this region.
S. aurata (Sm.) Ach.
S. scrobiculata (Scop.) Man.

NEPHROMA Ach.

N. arcticum (L.) Fr.
N. expallidum Nyl.
N. laevigatum Ach.
  Var. *parile* Nyl.
N. Lusitanicum Schr.

PELTIGERA Willd.

P. venosa (L.) Hoff.
P. apthosa (L.) Hoff.
P. polydactyla (Neck.) Hoff.
P. rufescens (Neck.) Hoff.
P. pulverulenta (Tayl.) Nyl. (*P. scabrosa* Th. Fr.)
P. malacea (Ach.) Fr.
P. canina (L.) Hoff.
  Var. *spuria* Ach.
  Var. *sorediata* Schr.
  Var. *spongiosa* Tuck.

SOLORINA ACH.

S. crocea (L.) Ach.
S. saccata (L.) Ach.

Physma Mass.

P. luridum Mont. A single specimen found.

Pannaria Del.

P. hypnorum (Hoff.) Koerb.
P. lanuginosum (Ach.) Koerb.
P. rubiginosa (Thunb.) Del.
P. leucosticta Tuck.
P. brunnea (Sw.) Mass. (*P. pezizoides* Sw.)
P. microphylla (Sw.) Del.
P. lepidiota Th. Fr.
P. tryptophyllum (Ach.) Man.
P. carnosa Dicks.

P. Waghornei n. sp.

Thallus thickened, congested and irregular, fissured, conglomerate, coarsely granulate, rugulose, from reddish brown to purplish and seated upon a thin limiting hypothallus; apothecia scattered but frequently conjoined, small, rounded and erect, and at length flat, with a prominent margin, from pale reddish to rufescent; spores ellipsoid, simple, $\frac{18-22}{7-8}$ mic.

On turfy earth. Evidently a distinct and well marked species, and not closely related to any other.

P. plumbea (Leight.) Del.

Collema Hoff.

P. melaenum Ach.
P. flaccidum Ach.

Leptogium Fr.

L. lacerum (Sw.) Fr.
L. tremelloides (L.) Fr.
Var. *cyanescens* Ach. (*Collema cyanescens* Schaer.)

Placodium DC.

P. elegans (Link.) DC.
P. murorum (Hoff.) DC.

F. *miniatum* Hoff. Thallus fulvescent, punctate; apothecia bright.

P. cirrochroum (Ach.) Hepp.

P. aurantiacum (Leight.) N. H.

P. cerinum (Hedw.) N. H.

Var. *pyraceum* Nyl.

F. *pyrithromum* Ach. Thallus gray to brownish, more or less rugulose; apothecia small, sunken and concave, pale green to buff-colored. Spores $\frac{10-14}{6-9}$ mic.

P. crenulatum Wahl.

P. vitellinum (Ehrh.) N. H.

Var. *aurellum* Ach.

LECANORA Ach.

L. rubina (Vill.) Ach.

L. muralis (Schrb.) Schr.

Var. *Garovaglii* Anzi.

Var. *saxicola* Scur.

L. pallida (Schrb.) Schr.

L. sordida (Pers.) Th. Fr.

L. atra Huds.

L. dispersa (Pers.) Nyl.

L. badia (Pers.) Ach.

L. Hageni Ach. (*L. umbrina* Mass.)

F. *zostericola* Nyl.

L. subfusca (L.) Ach.

Var. *hypnorum* (Wulf.) Ach.

Var. *argentata* Ach. (*L. campestris* Schr.)

Var. *atrynea* Ach.

Var. *coilocarpa* Ach.

Var. *distans* Ach. (*L. chlarona* Ach.).

F. *rugosa* Pers.

L. symmictera Nyl.

Closely allied to *L. varia* v. *symmicta* Ach., but differs as to the reaction. K–C. orange.

L. atrosulphurea (Wahl.) Ach.

L. OCHRACEORUBESCENS Arnold n. sp.

Thallus scattered, elevated, roundish or irregular, greenish or yellow, granular, granules at length becoming tortulose and distinct; apothecia prominent, elevated, biatorine, sessile and finally conglomerate, proper margin depressed or quite wanting, brownish green to olivaceous with a delicate bloom, spores ellipsoid hyaline, $\frac{9-14}{6-8}$ mic. On sandstone. This species is closely related to *L. Swartzii* Ach.

L. varia (Ehrh.) Nyl.

Var. *symmicta* Ach.

Var. *intricata* Nyl.

Var. *saepincola* Fr.

Var. *polytropa* Ehrh.

F. *illusoria* Ach.

Thallus evanescent, thin, apothecia dispersed, infrequent, large, disk plane, frequently convex, pale yellow, margin frequently obliterated.

L. ventosa (L.) Ach.

L. elatina Ach.

Var. *ochrophoea* Tuck.

Var. *minor* Tuck. (*Haematomma Cismonica* Belt).

L. pallescens (L.) Schr.

Var. *rosella* Tuck.

L. tartarea (L.) Ach.

F. *leprosa* Nyl.

F. *telephoroides* Th. M. Fr.

F. *grandinosa* Ach.

F. *macrocarpa* Th. Fr.

L. cenisia Ach.

L. cinerea (L.) Somf.

Var. *laevata* Fr.

L. calcarea (L.) Somf.

L. CINEREO–RUFESCENS (Ach.) Eck.

Thallus dark ashy white, paler towards the border, verrucose to areolate, rimose; hypothallus black; apothecia sunken in the thallus, convex, disk dark brown, bordered by an entire thalline margin; spores hyaline, ellipsoid, simple, $\frac{12-24}{7-10}$ mic. On rocks.

L. CAESIO–CINEREA (Nyl.) Eck.

Thallus ashy white to darker, thick, verrucose, areolate, broken; apothecia sunken in the areoles, concave, terminating in a white thalline border which finally becomes more or less prominent; spores hyaline, oblong, simple, $\frac{23-35}{12-15}$ mic. On rocks.

L. gibbosa Nyl.

L. fuscata (Schr.) Th. Fr.

Var. *rufescens* Th. Fr.

L. glaucocarpa (Wallr.) Ach.
F. *distans* Arn.
L. privigna (Ach.) Nyl.

RINODINA Mass.

R. sophodes (Ach.) Nyl.
R. turfacea (Wall.) Nyl.

PERTUSARIA DC.

P. bryantha (Ach.) Nyl.
P. velata (Turn.) Nyl.
P. panyrga (Ach.) Th. Fr.
P. multipuncta (Turn.) Nyl.
P. dactylina (Ach.) Nyl·
P. rhodocarpa Koerb.
P. communis D. C.
F. *rupestris* D. C.
P. leioplaca (Ach.) Schr.
P.laevigata (Nyl.) Arn. (*P. leioplaca* var. *laevigata* Th. Fr.)
P. subobducens Nyl. (*P. glomerata* Schr.)
P. protuberans Smf.
P. globularis Ach.

URCEOLARIA Ach.

U. scruposa (L.) Nyl.
Var. *bryophila* Esch.

THELOTREMA Ach.

T. lepadinum Ach.
T. subtile Tuck.

STEREOCAULON Schr.

S. coralloides Fr.
S. paschale (L.) Fr.
S. denudatum Fl.
S. condensatum Hoff.
S. tomentosum Th. Fr.
S. alpinum (Th. Fr.) Laur. (*S. tomentosum* var. *alpinum* Th. Fr.)
S. pileatum Ach.
S. nanodes Tuck.

PILOPHORUS Th. Fr.

P. cereolus Ach.
  Var. *fibula* Tuck.

CLADONIA Tuck.

C. symphicarpa Fr.
  Var. *epiphylla* (Ach.) Nyl.
C. cariosa (Ach.) Spreng.
C. decorticata Flk.
C. pyxidata (L.) Fr.
  Var. *simplex* Hoff.
  F. *costata* Fl.
  Var. *pocillum* Ach.
C. fimbriata (L.) Fr.
  Var. *tubaeformis* Fr.
  Var. *radiata* Fr.
C. degenerans Fl.
C. gracilis (L.) Nyl.
  Var. *verticillata* Hoff.
  Var. *verticillata* f. *phyllophora* Ehrh.
  Var. *hybrida* Schr.
  Var. *elongata* Fr.
  F. *macroceras* Tuck.
  F. *chordalis* Tuck.
  F. *amaura* Fl.
  F. *aspera* Fl.
C. cornuta (L.) Fr.
C. turgida (Ehr.) Hoff.
  Var. *conspicua* (Ach.) Nyl.
C. papillaria (Esch.) Hoff.
C. cenotea (Act.) Schs.
  Var. *furcellata* Fr.
C. squamosa Hoff.
  F. *turfacea* Rehm.
  F. *ventricosa* Fr.
  F. *densicollis* Hoff.
  F. *asperella* Flk.
C. furcata (Huds.) Fr.
  Var. *crispata* Fl.

Var. *racemosa* Fl.
Var. *subulata* Fl.
Var. *squamulosa* Schr.
Var. *adspersa* Fl.
C. rangiferina (L.) Hoff.
C. sylvatica L.
Var. *alpestris* L.
C. Botrytes (Hag.) Hoff.
C. carneola Fr.
Var. *cyanipes* Somf.
C. amaurocraea (Fl.) Schr.
C. uncinalis (L.) Fr.
Var. *adunca* Auct.
Var. *Caroliniana* Tuck.
Var. *turgescens* Fr.
C. Boryi Tuck. (*C. lacunosa* Bory.)
C. chlorophæa L.
F. *simplex* Hoff.

C. MULTIBRACHIATA (Fl.) Eck.

Thallus ashy brown, squamulose, mealy; podetia erect, slender, mostly smooth with repeated proliferations or branches, pervious; spores curved, $\frac{6-7}{1-3}$ mic. This plant is somewhat allied to *C. Floerkeana* Fr., from which it is not easily separated, but considered by Dr. Arnold as distinct.

C. Floerkeana Fr.
C. cristatella Tuck.
Var. *ochrocarpia* Tuck.
C. pulchella Schw.
C. macilenta (Esch.) Hoff.
F. *clavata* Ach.
C. digitata Fl.
F. *brachytes* Ach.
F. *monstrosa* Ach.
C. deformis (L.) Hoff.
C. coccifera L. (*C. cornucopioides* (L.) Fr.)
F. *pleurotica* Ach.
C. bellidiflora (Ach.) Schr.
Var. *Hookeri* Nyl.

THAMNOLIA Ach.

T. vermicularis (Sw.) Schr.

BAEOMYCES Fee.

B. aeruginosus Scop.

B. byssoides (L.) Schr.

B. roseus Pers.

Var. *fungoides* (Sw.) Ach. (*Sphyridium fungiformis* Scop.)

BIATORA Fr.

B. granulosa (Esch.) Poetch.

Var. *escharoides* Esch. Thallus very minutely granulose, yellow or ashy white; apothecia confluent, diffiform, strongly convex and immarginate, dark brown to reddish chestnut; spores simple, $\frac{9-16}{4-6}$ mic. On clay soil.

B. coarctata Sm.

Var. *elascista* Ach.

Thallus white or greyish, very thin, leprous and effuse, apothecia sessile, quite innate, concave or plane with a well defined prominent white coarctate margin. Spores similar.

B. flexuosa Fr.

B. russula (Ach.) Mont.

B. cinnabarina (Somf.) Fr.

B. vernalis (L.) Fr.

Var. *helvola* Koerb.

B. sanguineo-atra (Fr.) Tuck. Spores about $\frac{10-18}{5-9}$ mic.

B. Berengeriana Nyl.

This plant is allied to *B. sanguneo-atra* Fr. but may be readily distinguished by the absence of violet or bluish granules found among the paraphyses in that species. Spores $\frac{12-18}{4-5}$ mic.

B. rufo-fusca Anzi.

B. turgidula Fr.

B. rivulosa (Ach.) Fr.

B. ARCUATULA (Arn.) Eck.

Thallus flat and thickened, areolate, rimulose, olivaceous to fuscescent; apothecia brownish-black to very black, margin elevated concolorous and shining, epithecium brown, spores hyaline, simple, 2–4-guttate, somewhat curved and obtuse at the apex, $\frac{12-14}{3-4}$ mic. A species closely related to *B. rivulosa* (Ach.) Fr. On rocks.

B. SCRUPULOSA n. sp.

Thallus of thickened coalesing granules, areolate, rimulose, pale olive to yellowish brown, areoles adnate, contiguous, mingling into a continuous uneaven crust; apothecia scattered, diffiform, erect, black, plane and somewhat depressed, surrounded by a tortulous erect concolorous margin; spores simple, broadly ellipsoid, hyaline, $\frac{8-9}{5-6}$ mic. A well marked species which seems to approach *B. Kochiana* Hepp.

B. ALBO-FUSCESCENS (Nyl.) Eck.

Thallus thinly diffused and even over the surface, plane and slightly granular or furfuraceous, or at length quite smooth and glaucous; epithecium pale; apothecia very sparse, rounded and elevated, at length flat; disk brown and prominent, reddish, margin elevated. Spores ellipsoid, pointed, $\frac{9-11}{4}$ mic. On rocks.

B. mollis Wahl.

B. Nylanderi Anzi.

B. uliginosa (Schr.) Fr.

B. varians Ach. (*B. exigua* Chaub.)

B. mixta Fr. (*B. tricolor* Nyl.)

B. Laureri Hepp.

B. Heerii Hepp. Parasitic on *Solorina saccata*.

B. STEREOCAULORUM (Th. Fr.) Eck. (*Biatorina* Lich. Miquelon, Arnold.) Thallus mostly wanting; apothecia very small, black, plane; epithecium brown, hymenium colorless to bluish, paraphyses loosely disposed; spores hyaline, bilocular, 8 in thekes, $\frac{15}{18}$ mic. Parasitic on *Stereocaulon alpinum*.

B. sphaeroides Dick.

B. hypnophila Turn.

B. artyta Ach.

B. rubella Esch.

B. RUPESTRIS (Sch.) Eck. Thallus cinerascent, thin and closely adnate, apothecia flat, innate, smooth, rufescent with a raised margin around the sunken disk. Spores immature. On rocks.

B. muscorum Sw.

B. umbrina Ach.

B. OBSCURATA (Sm.) Eck. Thallus composed of minute pale ashy to white rugose granules; apothecia minute, rounded and flat, dark brown to black, smooth and shining with a receding margin, very numerous. Spores broadly ellipsoid 4-locular, $\frac{15-16}{4-4\frac{1}{2}}$ mic. On dead moss.

B. PALLIDA (Arn.) Eck.

Thallus thin, chinky and minutely granulose, sparsely scattered over a thin but even surface, yellowish brown to fuscous; apothecia small, rounded, black, prominent, slightly flattish or convex, with a concolorous thalline margin; hypothallus mostly wanting. Spores fusiform, 6-locular, $\frac{36-39}{2-4}$ mic. On smooth barks.

B. CAESIO-RUFA (Ach.) Eck.

Thallus thin, white, scattered irregularly, of rounded and closely adnate granules, but forming an even uniform crust; apothecia sessile, minute, quite black, turgid, and becoming flat, with a persistent regular elevated margin; spores mostly 4-locular, $\frac{24-28}{5-6}$ mic. On smooth barks.

HETEROTHECIUM Flot.

H. grossum Pers.
H sanguinarium (L.) Flot.
  Var. *endorhoda* Th. Fr.
  Var. *effusa* Ach.
H. alpina Ach.
H. porphyrites Tuck.
H. leucoxanthum (Spreng.) Mass.
H. pezizoideum (Ach.) Flot.

LECIDEA Ach.

L. panaeola (Ach.) Fr.
L. platycarpa Ach.
  Var. *superba* Ach.
L enteroleuca (Ach.) Fr.
  Var. *diasemoides* Nyl.
L fusco-atra L.
L fuscescens Somf.
L. polycarpa Fr.

Var. *declinans* Nyl. Thallus mostly crustaceous; hypothecium fuscous.

Var. *sublactea* Somf.

L. CRENULATA (Dicks.) Eck.

Thallus thin, evanescent, cinerascent to pale yellowish grey; apothecia black, plane and simple, naked, with a raised flexuous crenulate proper margin; spores ellipsoid, hyaline, simple, $\frac{45}{1-5}$ mic. On rocks.

L crustulata Ach.

Thallus pale to brownish or often grey, adnate, thin, tartareous effuse, subrimulose to areolate; apothecia numerous, dispersed, sessile and simple, black with a distinct thin margin; hypothecium swollen, nearly brown; spores 8 in the thekes, simple, oblong, $\frac{14-15}{7-8}$ mic. On rocks.

L albocoerulescens (Wulf.) Schr.

Var. *flavocoerulescens* Schr.

Var. *cinereoatra* Ach.

L. variegata Fr. (*L. pantherina* Th. Fr.)

L. macrocarpa D. C.

L. tessellata Fl. (*L. cyanea* Th. Fr.)

L. lapicida (Ach.) Fr.

L. leucothallina Ach.

L. empetrea Nyl.

L. tenebrosa Fl.

L. latypea Ach.

L. DISTANS n. sp.

Thallus thin, evanescent, but at length becoming minutely granulose and frequently continuous over a scurfy surface; apothecia mostly subsessile, elevated, large, flat, black with a depressed disk surrounded by a conspicuous granulose and crenate margin; disk covered by a delicate evanescent thin bloom; hypothecium pale; spores long, ellipsoid, simple, $\frac{12-14}{3-4}$ mic. On rocks. Labrador

L. contigua var. *meiospora* Nyl.

Thallus thin, ashy white, areolate, rimulose; apothecia black, plane, with a proper margin, disk somewhat pruinose, spores simple, hyaline, $\frac{11-16}{6-8}$ mic. On rocks.

L. Kochiana Hepp.

Thallus pale ashy brown to fuscescent, rimose, areolate, broken, areoles sunken, plane, bordered by a black margin; apothecia innate, black, immarginate, flexuous or slightly angulose, difform; disk plane, polished and smooth; spores 8 in the thekes, oblong, simple, $\frac{8-11}{6-8}$ mic. On rocks.

L. dispansa Nyl. (*L. expansa* Nyl.)

Thallus furfuraceous, rimulose, thin, black; apothecia very numerous, minute, sessile, scattered, black, plane, the margin very smooth; hypothecium thin, fuscous; epithecium hyaline; spores about 8 in the thekes, simple, ellipsoid, $\frac{10-12}{4-5}$ mic. On rocks.

L. auriculata Th. Fr.

L. sylvicola (Flot.) Nyl.

L. CONFERENDA (Nyl.) Eck.

Thallus verruculose, granulate, obscurely cinerascent; apothecia very small, black, convex and glaucous; spores oblong, simple, hyaline, $\frac{12-14}{3-4}$ mic. On rocks.

BUELLIA De Not.

B. capitulata Th. Fr. var. *erubescens* (Flot.) Eck.

Thallus of thin smooth flat discrete granules, becoming at length areolate; areoles irregular and evanescent at the outer margin; apothecia scattered, more or less sessile, small and very black, flat and bordered by a well raised margin; spores ellipsoid, bilocular, fuscescent, $\frac{18-19}{6-7}$ mic. On smooth barks.

B. PUNCTIFORMIS (Hoff.) Eck.

Thallus very thin, scurfy, minutely granular, grey or whitish, becoming at length nearly obsolete or with a delicate coloration; apothecia small, flat, granular and the disk quite rugose, brownish-black to very black, with a raised stout thick granular margin; spores bilocular, $\frac{12}{6}$ mic. On smooth barks.

B. albo-atra (Hoff.) Th. Fr.

B. parasema (Ach.) Fr.

B. disciformis Fr.

B. spuria Schr.

B. lepidastra Tuck.

B. myriocarpa D. C.

B. ATRATA (Sm.) Eck.

Thallus blackish to ashy brown, areolate, broken, areoles plane, small, smooth, convex, hypothallus black; apothecia springing from the hypothallus, usually innate, small, appressed, margin thin, entire; spores 8 in the thekes, bilocular, fuscous, $\frac{12-17}{7-10}$ mic. On rocks.

B. colludens Nyl.

B. EXCENTRICA (Nyl.) Eck.

Thallus brownish, white or gray, thin, sparingly more or less broken; apothecia pale, black, sessile, plane with a thickened obtuse margin. Spores $\frac{32-37}{15-22}$ mic., the cells murilocular.

B petraea (Flot.) Koerb.

Var. *grandis* Flk.

Var. *Montagnei* Tuck. (*B. atro-alba* Fr.)

F. *empetraea* Nyl.

B. CONIOPSOIDEUM (Hepp.) Eck.

Thallus consisting of scattered white irregular flat scales, which are diffused over a black hypothallus; apothecia arising from the hypothallus, sparingly scattered, black, flat and somewhat prominent, with a raised rugose margin; disk roughened and finely papillose; spores ellipsoid, 4-locular, $\frac{22-24}{7-8}$ mic. On rocks.

B. geographica (Fl.) Tuck.
B. pertusaricola Willey.
B. parmeliarium Somf.
B. saxatilis (Sch.) Koerb.
B. scabrosa (Ach.) Koerb.

B. OBSCURATA (Ach. Koerb.) Eck.

Thallus pale to fuscesent or rufofuscescent, thin, finally areolate, continuous, areoles plane, simple; apothecia black, naked, plane, sessile, innate or strongly adnate with a thicker obtuse pale margin; spores 8 in the thekes, ellipsoid, murilocular, $\frac{24-50}{10-40}$ mic. On rocks.

B. RIVULARIS (Flot.) Eck.

Thallus pale olive brown, areolate, diffiform, areoles flat upon a black hypothallus; apothecia large, flat, sunken in the areoles, black with a prominent raised waving margin; spores broadly ellipsoid, bilocular, fuscous, $\frac{30-33}{12-15}$ mic. On rocks.

B. COPELANDI (Koerb.) Eck.

Thallus composed of large irregular coarse whitish granules, becoming areolate, dispersed, seated upon a black hypothallus; apothecia large, black and prominent, more or less finely turbuculate, but becoming flattish and concave, with a persistent margin; spores ellipsoid, bilocular, fuscescent, $\frac{18-24}{9-12}$ mic. On rocks.

B. badioatra (Fl.) Schr.

B. CONCRETA (Koerb.) Eck.

Thallus minutely granulose, closely adnate, pale ashy to whitish, bordered by a flexuous hypothalline line; apothecia sessile, minute and innate, immarginate with a thickened brown border; spores ellipsoid, murilocular, $\frac{24-50}{10-40}$ mic. On rocks.

B. CALCAREA (Weis) Eck.

Thallus determinate, white, roundish, of mealy or tartareous granules, areolate, rimulose towards the centre, configurate at the border; apothecia large, black, innate, plane, bluish, pruinose, convex, surrounded by a white thalline margin, proper margin dark, persistent; spores ellipsoid to oblong, 4-locular, $\frac{18-20}{3-6}$ mic. On rocks.

B. RUBESCENS (Arn.) Eck.

Thallus very thin, white, uneven and broken up into areole-like flat scales; apothecia scattered, sessile, small, from flat to concave, with a prominent raised margin but frequently wanting, from reddish-brown to black; spores broadly ellipsoid, bilocular, $\frac{18-21}{3-6}$ mic. On smooth barks.

LECANACTIS (Esch. Kbr.) Tuck.

L. abietina Ach.

L. premnea Ach.

OPEGRAPHA (Humb.) Ach.

O. zonata Kbr.

Thallus rufous to ferruginous, thin, subtartareous, smoothish, covered by nnmerous yellow or pale whitish soredia, marked at the border by conspicuous thick erect dark lines forming the hypothallus; apothecia fuscous to black, scattered, sparse and sessile; spores hyaline, contracted, fusciform, pointed, $\frac{16-20}{2-3}$ mic. On rocks.

O. atra Ach.

O. vulgata Ach.

XYLOGRAPHA Fr.

X. opegraphella Nyl.

X. parallela Fr.

GRAPHIS Ach.

G. scripta (L.) Ach.
  Var. *recta* Schr.
  Var. *varia* Ach.
  Var. *limitata* Schr.
  Var. *pulverulenta* Pers.
  F. *radiata* Leight.
  F. *flexuosa* Leight.
  F. *typographa* Willd.

ARTHONIA Ach.

A. radiata Pers.
  Var. *Swartzoidea* Nyl.
A. spectabilis Fl.
A. punctiformis Ach.
A. patellulata Nyl.
A. raunidia Nyl.

SPHAEROPHORUS Pers.

S. fragilis (L.) Pers.
S. coralloides Pers. (*S. globiferus* (L.) D. C.)

ACOLIUM Fee.

A. tigillare (Ach.) D. N.

CALICIUM Ach.

C. subtile Fr.
C. turbinatum Pers.

ENDOCARPON Hedw.

E. miniatum (L.) Schr.
  Var. *complicatum* Schr.
  Var. *fulvofuscum* Tuck.
E. cinereum Pers.

SEGESTRIA Fr.

S. majusculum Nyl.

TRYPETHELIUM Ach.

T. virens Tuck.

SAGEDIA Mass. Kbr.

S. Cestrensis Tuck.
S. oxyspora (Nyl.) Tuck.

VERRUCARIA Pers.

V. maura Wahlb.

Thallus dark reddish or jet black, tumid, polished, areolae smooth covered with minute points; apothecia immersed and enclosed in the thallus, scattered, roundish; epithecium conspicuous, poriform; perithecium spreading at the base, internally black; spores oblong, simple, $\frac{12-16}{7-8}$ mic. On rocks.

V. epigaea Pers.
V. theliodes Smf.
V. bryophila Lonnr. (*Polyblastia*).
V. rimosicola Leight.

Thallus wanting; apothecia black, minute, sessile, rounded, shining and polished; perithecium entire, black; epithecium poriform; spores 8 in. the thekes, brown, oblong to linear, 4-locular, constricted, $\frac{15-20}{6-8}$ mic. Parasitic on *Buellia excentricum.*

PYRENULA Ach.

P. punctiformis Ach.
P. glabrata Ach.
P. lactea Mass.
P. thelaena (Ach.) Tuck.
P. nitidella Mull.

A Diatomaceous Deposit from an Artesian Well at Wildwood, N. J.

BY CHARLES S. BOYER.

An artesian well sunk recently at Wildwood, N. J., exhibits at certain depths diatomaceous deposits of unusual interest. Mr. Woolman, whose researches into the geology of artesian borings are well known, has sent me samples of earths with the request that I enumerate the diatoms found therein. The accompanying list includes specimens occurring in a bed from 78 to 180 feet deep, of which Mr. Woolman remarks in the annual report of the Geological Survey of New Jersey for 1893 (page 401) that "a corresponding clay bed does not exist beneath the beaches to the northward, if we may judge by the specimens of borings furnished from the various wells or by the records where no specimens were obtained. It was probably in some way associated with the deposits of the Delaware River delta in a somewhat recently past geological age, and before the present peninsula of Cape May was formed."

It is not the purpose of the present paper to give a list of the forms obtained from the entire series of the well boring which has reached the depth of 1245 feet, passing through beds apparently identical with the Miocene deposits noticed at Atlantic City and which have already been described, but as the fresh water forms are very numerous and as there are associated with them certain marine and brackish water species not heretofore noticed in North America, the enumeration of all the diatoms thus far seen at the depths of from 78 to 180 feet, is here given.

The occurrence of *Polymyxus coronalis* is of peculiar interest, as it has been hitherto considered as growing exclusively at the mouths of the Para and the Amazon. It is not a mere accidental form, but is abundant in the deposit in all its numerous variations. Several years ago I found one specimen in material from one of the Atlantic City wells, but supposed at the time that it might have been a waif cast upon the shore. As *Polymyxus* now flourishes only in warmer waters the conclusion must be reached that the Delaware River delta formed the deposit under conditions quite different from those existing at the present time. It is at any rate now extinct along the North Atlantic coast.

The nomenclature of the following list is based upon DeToni's Sylloge Algarum, except in a few cases.

Achnanthes Hudsonis Grun.

A. inflata (Kütz.) Grun.

A. subsessilis Ehr.

Actinocyclus Ehrenbergii Ralfs.

A. subtilis Greg.

Actinoptychus heliopelta Grun. forma minor.

Only one specimen has been noticed.

A. undulatus Ehr.

A. vulgaris Schum.

Amphora ovalis (Bréb.) Kütz. var. *gracilis* (Ehr.) V. H.

Aulacodiscus Argus Ehr.

Auliscus pruinosus Bail.

Biddulphia Rhombus Wm. Sm.

Brebissonia Boeckii (Kütz.) Grun.

I have noticed this form in material from the Saguenay River, Can.

Campylodiscus echeneis Ehr.

The habitat of this species is usually given as marine or brackish water. Van Heurck is the only authority, as far as I have noticed, who states that it occurs in fresh water. I have found several specimens in mud taken from a supply reservoir in Philadelphia, the water of which is drawn from the Schuylkill River.

Cerataulus laevis Roper.

Cocconeis placentula Ehr.

Coscinodiscus Argus Ehr.

C. excentricus Ehr.

C. fasciculatus A. Schm.
C. marginatus Ehr.
C. minor Ehr.
C. nitidulus Greg.
C. Oculus-Iridis Ehr.
C. radiatus Ehr.
C. subtilis Ehr.
Cyclotella Kützingiana Thw.
Cymbella affinis Kütz.
C. cistula (Hempr.) Kirchn.
C. cuspidata Kütz.
C. cymbiformis Ehr.
C. Ehrenbergii Kütz.
C. gastroides Kütz.
C. lanceolata (Ehr.) Kirchn.
C. tumida (Breb.) V. H.
Encyonema ventricosum Kütz.
Cystopleura (*Epithemia*) *Argus* (Ehr.) Kunze.

An abnormal form with flexuose outline has been noticed.

C. gibba (Ehr.) Kunze.
C. gibberula (Ehr ?) Kunze.
C. Musculus (Kütz.) Kunze.
C. Musculus constricta (Bréb.) V. H.
C. Sorex (Kütz.) Kunze.
C. Zebra (Ehr.) Kunze.
Eunotia Arcus Ehr.
E. diodon Ehr.
E. impressa Ehr.
E. major (W. Sm.) Rab.
E. parallela Ehr.
E. pectinalis (Dillw ?) Rab.
E. praerupta Ehr.
E. robusta Ralfs.
E. tetraodon Ehr.
E. triodon Ehr.
Gomphonema acuminatum coronatum Ehr.
G. Augur Ehr.
G. capitatum Ralfs.

G. geminatum (Lyngb.) Ag.
G. gracile Ehr.
G. lanceolatum Kütz.
G. olivaceum (Lyngb.) Kütz.
G. turgidum Ehr.
G. Vibrio Ehr.
Hyalodiscus stelliger Bail.
H. subtilis Bail.

HYDROSERA (TERPSINOE ?) NOVAE-CAESAREAE Boyer n. sp.

At first sight this species might appear to be a variety of *Hydrosera* (*Triceratium*) *trifoliata* Cleve, but a close comparison will show that the two are distinct.

Triangular, sides concave, *angles broad at the base, equally divided* into three projections, surface *sparsely punctate*. In Cleve's species the angles are cuneate and the middle lobe or tooth is narrower than the two outer, while the punctae are quite evident except at the center of the valve. There is a marked difference in general appearance, the New Jersey form being much less robust than that from New Zealand. It is quite common in the deposit and is of interest, as there is no form similar to it except that from New Zealand with the exception of two specimens noticed by Mr. Heinrich Reis in clay found near Cold Spring, Long Island, which discovery, however, was antedated by that made in the Wildwood material. I have not seen Mr. Reis' specimens, which he identifies as *Triceratum trifoliatum* and do not know, therefore, whether the Wildwood and Cold Spring forms are identical.

Melosira granulata (Ehr.) Ralfs.
Navicula acrosphaeria Rab.
N. affinis Ehr.
N. Americana Ehr.
N. bicapitata Lagerst.
N. Bombus (Ehr.) Kütz.
N. Brebissonii Kütz.
N. columnaris Ehr.
N. Crabro (Ehr.) Kütz.
N. Dactylus Ehr.
N. Dariana A. Schm.
N. decurrens Kütz.
N. distans (W. Sm.) Ralfs.
N. elliptica Kütz.

N. Fischeri A. Schm.
N. formosa Greg.
N. gibba Ehr.
N. Hitchcockii Ehr.
N. humerosa Bréb.
N. Iridis amphirhyncus Ehr.
N. Kamorthensis Grun.
N. latissima Greg.
N. Lewisiana Grev.
N. Liber linearis (Grun.) V. H.
N. limosa Kütz.
N. Lyra Ehr.
N. major Kütz.
N. mesolepta Ehr.
N. mesolepta nodosa Ehr.
N. mesostyla Ehr.
N. nobilis (Ehr.) Kütz.
N. pachyptera Kütz.
N. permagna (Bail.) Edw.
N. peregrina (Ehr.?) Kütz.
N. placentula (Ehr.) Kütz.
N. polyonca Breb.
N. pusilla W. Sm.
N. rhomboides Ehr.
N. sphaerophora Kütz.
N. Smithii Bréb.
N. stauroptera parva Grun.
N. tabellaria Kütz.
N. termitina Ehr.
N. trinodis inflata Schultze.
N. viridis (Nitzsch) Kütz.
Nitzschia Campeachiana Grun.
N. cirumsuta (Bail.) Grun.
N. granulata Grun.
N. salinarum Grun.
N. scalaris (Ehr. ?) W. Sm.
N. Sigma (Kütz), W. Sm.
N. tryblionella maxima Grun.

Odontidium mutabile genuinum Grun.
Plagiogramma tessellatum Grev., rare.
Pleurosigma eximium (Thw.) Grun. and Cl.
P. Sciotoense Sulliv.
P. Spencerii (Quek.) W. Sm.
Polymyxus coronalis L. W. Bail.
Pseudauliscus radiatus Bail.
Pseudoeunotia flexuosa (Breb.) Grun.
Rhaphoneis amphiceros Ehr.
R. Belgica Grun.
R. gemmifera Ehr.
R. Rhombus Ehr.
Stauroneis acuta W. Sm.
S. gracilis Ehr.
S. Phoenicenteron Ehr.
Surirella angusta Kütz.
S. biseriata (Ehr.) Bréb.
S. cruciata A. Schm.
S. crumena Bréb.
S. elegans Ehr.
S. Febigerii Lewis.
S. oblonga Ehr.
S. ovalis Bréb.
S. ovalis ovata (Kütz) V. H.
S. splendida Ehr.
S. striatula Turp.
S. tenera Greg.

SURIRELLA WOOLMANIANA Peticolas, n. sp.

Mr. Peticolas, who discovered several specimens, remarks that it differs from *S. Gemma*, of which I had at first considered it a variety, in " size, outline, areolation and the hyaline centre."

Valves broadly obovate, rounded at both ends; costae slightly twisted, not reaching the median line, thus forming a pseudoraphe broadening at the centre. Costae and intercostate striae much more robust than in *S. Gemma*. It somewhat approaches certain varieties of *S. striatula*.

Synedra delicatissima W. Sm.
S. investiens W. Sm.
Terpsinoe Americana (Bail.) Ralfs.

Tetracyclus emarginatus (Ehr.) W. Sm.
T. lacustris Ralfs.
Triceratium alternans Bail.
T. favus Ehr.
T. sculptum Shadb.

Of the above about 80 are exclusively fresh water forms, 47 exclusively marine, while the others are found in fresh water and brackish or in brackish and marine.

Preliminary Notes on Nelumbo lutea.

BY BENJ. HERITAGE.

(PLATE 23~~1~~8.)

In August, 1890, being desirous of investigating the root growth of *Nelumbo lutea*, the late Isaac Burk, and self visited the mill-pond at Sharptown, Salem County, N. J., for that purpose.

There were about eight acres thickly covered with the species, which presented a most gorgeous sight.

We procured a boat, and after considerable research, we found a place at which the water was but a few inches in depth, over a very soft mud. He managed the boat, and seating ourself on its bottom, with an arm stripped to the shoulder we selected one of the large leaves which had a flower stalk in close proximity.

These we traced with the hand, down into the ooze, to their common point of attachment, which brought the arm up to the elbow in the mud. There we found a very dense cluster of fibrous roots which were loosened, but this did not release the plant; as there was a horizontal portion, the size of a finger extending from it in opposite directions. The truth then dawned upon us that this majestic plant is stoloniferous!

We traced this horizontal stolon or stem until we accidentally broke it, before reaching its termination in either direction. Its course was quite direct, and lay at a uniform depth of about one foot beneath the surface of the mud.

At short distances we encountered very many other similar subterranean vines or stolons—portions of other plants perhaps lying mostly in the same plane and crossing the pathway of our plant at various angles.

Such as were above ours had to be severed in order to liberate the one we were in quest of. At varying distances we found other clusters of roots, from each of which a single, large, peltate leaf rose about two feet above the surface of the water, while in the axil of several of them there was a flower stalk as tall. At many of the nodes we found a branch, each of which we traced until it, like the main stem, was accidentally broken, except in two instances, in which we secured the growing points. Upon finding our plants disconnected with the earth at all points, after about four hours' assiduous labor, we carefully took it on board, rowed ashore, spread it out upon the grass, and with the miller's "ten-foot pole" accurately measured it. The main stem was forty-seven feet long, and the combined length of the branches forty-three; in all ninety feet! It was to us a revelation, and exceedingly interesting, but it would have been even more so had we succeeded in unearthing the *entire* plant which, as it lay upon the ground before us, proved itself to be an aquatic *vine* of gigantic proportions.

The internodes were smooth, dull-white and of a uniform size throughout the main stem; they were about half an inch in diameter and were furnished with seven large air passages arranged in a circle equi-distant from a small central one and the epidermis. They were plentifully supplied with spiral tissue which could be drawn out a quarter of a yard before complete separation took place. These internodes varied in length from two feet, which was the shortest one in the main stem to *five* feet three inches, the longest in our specimen. Those of the branches were much shorter and their diameter less. *Long* internodes insured the separation of the leaves so that they could fully develop without coming in contact with each other, and perhaps the nature of the soil favored their growth, in confirmation of which we have seen *Carex vestita* Willd., growing in compact soil with *stolons* only a few inches long, whereas in an open porous soil they sometimes exceed two feet in length between the plants.

The diameter of the nodes was considerably greater than that of the internodes and it was from these alone the roots originated.

Later examination has shown the roots to be arranged in six-usually-circular clusters placed side by side and extending completely around the node, those growing from the upper side of the node also follow the general law of root growth, *i. e.*, *descend.*

In those examined the number in each cluster ranged from 14 to 21, averaging 110 roots at a node.

The branches occurred regularly at several consecutive nodes, but irregularly at others. They sometimes extended to the right and to the left alternately like those of a Cucurbitaceous vine; at an estimated angle with the main stem of about 60° upon an average.

During the course of our investigation, the queries arose whether those long internodes are perennial or survive but a single season? Whether the plantlet at each node has a permanent character or otherwise; and, if the former prove true, whether each node becomes the centre from which new growth radiates the following year?

We contemplated a further inquiry the succeeding spring, hoping to solve those questions; but, during the interval, our friend was stricken with paralysis and incapacitated for additional research, and the matter rested.

In November last and again a month later, in company with Chas D. Lippincott, we visited the locality to inquire into the winter status of the plant, as well as to determine more fully its method of growth; and perchance to throw some light upon the above questions. The results thus far obtained are here submitted.

We secured many specimens containing buds, but in every instance they were at or near the end of a stem or branch, and consisted of one or generally two tuber-like enlargements of the stem following each other consecutively. The internodes of these thickened stems had failed to develop longitudinally more than a few inches, while transversely their diameter was greatly increased. The general structure of the stem was maintianed in the tubers, and the leaf buds were invariably found at their ends—the nodes—which had undergone but a slight modification. The tubers obtained varied from three to eleven inches in length, and very closely resembled a banana in appearance, both in regard to shape and proportions; except that the color was creamy-white, marked with purplish dots. They were generally somewhat flattened on the side from which the lateral bud grew at the next lower node, which might indicate that the growth was directed to the development of the bud at that point rather than into that portion of the tuber in line with and beyond it.

Their texture is crisp, and it cuts with that peculiar grating which we hear and feel while cutting a raw potato with a thick knife; and which is doubtless owing, as Prof. Halsted has shown with relation to the winter buds of trees, to the presence of large quantities of starch stored during the growing season, for the rapid development of the embryo leaves in early spring, before they are capable of assimilating their nourishment.

There are at least two kinds of buds shown at the tubers; First, lateral leaf buds, developed at the nodes; and secondly, terminal buds, which contain an embryo vine. They are not uniform in size; the largest of the former measured five and one-half inches in length, and consisted of a single petiole surmounted by an involute blade two inches in diameter; the whole completely enveloped by a whitish, brittle succulent sheath, the edges of which overlap.

We obtained some specimens in which growth had extended just beyond the full capacity of the sheath, and it had been torn completely asunder below the blade, both portions having turned black.

The severed part would doubtless have continued to envelop the blade, and it would have been carried up through the mud by the lengthening petiole—as the calyptra of Musci is borne up on the apex of the capsule—and when its office of protection shall have been fulfilled the unfolding leaf will cast it aside.

The terminal buds are shorter and thicker than the others, and include a portion of the future vine. An internode and node, together with its young leaf, are all well formed; also a growing point beyond, and, like the leaf buds, they are protected by a similar sheath.

We also obtained the black shrunken shells of old tubers, from which all the nutriment had been drawn, which, with contiguous portions of the vine, were lifeless.

The roots at the nodes, so far as observation has thus far extended, all die in the fall; but we found much vitality still existing in the nodes. Portions of the internodes were discolored, had lost their rigidity, and were dead; such might have grown early in the season, and were the first to die. Other portions appeared full of life, and their cells, as well as those of the nodes, were filled with starch grains; but not one of the many nodes examined exhibited a bud, except as above stated, those at or near the extremity of the vines. This absence of buds, and the dead roots, suggest the early dissolution of all parts of the plant except those last formed. Although other portions of this wonderful plant may survive the winter, yet if this prove true it is presumed that after growth re-commences in the buds of the tubers, the starch in the vines behind them will be utilized, after which they will probably die. Let investigation be directed to this, as well as to other points of interest.

The living buds are at the ends of the tubers. Back of the tubers we have a long vine in which starch is stored, and which contains no buds, and show no signs of further growth. From this it appears that both the vines and tubers after being fully developed serve merely to store nutritive materials, and to transmit them to the growing points.

We now behold this noble plant not only as a true aquatic, subterranean vine, but it is metamorphosed into a *migratory* vine. Why migratory? Simply because the next year's buds are so far removed from the location of those of the last. Just how far a plant removes its situation in a single season can only be determined by locating one in early spring, tracing it throughout its entire length in the fall, and noting the position of the next year's buds. Our specimen furnished ocular demonstration that this removal must have been more than forty-seven feet! Is this method of growth found in any other genus than *Nelumbo?* we ask for information. The annual character of the growth from each particular node is a most wise provision. If all those plantlets survived the winter, and became the centre from which new growth proceeded, there soon be an overcrowding; and none would have room to develop naturally when deterioration and extinction would eventually ensue.

We are here furnished with another illustration, among many seen on every side around us, of unmistakable evidences of perfected thought in their creation, each being peculiarly adapted to the position it holds in the divine economy.

I am indebted to Dr. Ida A. Keller for the accompanying drawings and explanation of figures.

MICKLETON, N. J., 1894.

Explanation of Plate 231.

I. Diagram of vine of *Nelumbo lutea* Pers.
St, St.—main stem 47 feet long.
X—unknown dist. to tubers with living buds—T.
X′— " " old tuber shells—O. T.

II. End of stem ¼ of natural size.
St.—unthickened stem.
St′—two tubers terminating the stem.
Sh.—remaining portions of sheaths (black).
B—terminal bud which will develop into a stem.
B′.—axillary bud (sheath which covered it removed).
L. B′.—leaf bud, subtending terminal bud. It has a sheath of its own, which has not been removed, is distinct from the sheath marked Sh. The former is not black, the latter is.
L. B′.—leaf bud, upper portion exposed by removal of sheath.
R—points from which roots will emerge, these arranged in groups as indicated in the drawing.
R′—dead roots showing their articulations.
P—petiole of the last leaf of the season (now dead).

III.—Cross section of vine, natural size.
A—air passage.

IV. Cross section of tuber, natural size (shows the flattening).

V. " " involute leaf bud enlarged.
A—air passage.

VI. Starch grains. The largest represented (′) being .0492×.0328 mm.

On the Carpels of Opulaster malvacea (Greene).

This species was originally described by Prof. Greene in Pitt. **2**: 30, 1889, as *Neillia malvacea*, from specimens collected by the author himself at the north shore of Lake Pend d'Oreille, in Idaho. In the diagnosis of the species it is referred to a section of the genus characterized by indehiscent carpels.

Recently I had occasion to investigate the fruit characters of this *Opulaster* and find that the carpels do rupture along well-defined sutures, although it takes place tardily. The fruit of the species is usually 2-carpellary, very rarely 3-carpellary. Each carpel is from 1–3-ovuled, developing as many or fewer seeds; the usual number is 1 or 2. At maturity the carpel is nearly triangular, much flattened, not at all inflated, and when well developed it measures about 4.5 mm. in length, and 3.5 mm. in width across the broadest portion. The seeds are oblong, somewhat compressed, nearly 2 mm. long and 1.3 mm. wide, grayish in color, with a firm polished testa and extremely bitter taste. The two carpels seen together bear a great deal of resemblance to the silicle of a *Lepidium* as Prof. Greene notes.

The carpels are connate except at the divergent apices. They usually separate along a lateral line at maturity. Occasionally this line of demarcation does not form and they remain united. The pedicels commonly fall away from the axis of inflorescence in autumn or early winter by the development of a constriction at their bases, carrying the unopened fruit with them. The dehiscence of the carpels does not usually occur until after they reach the ground, but if the pedicels are not detached from the axis of the corymb in the fall, which sometimes happens, the carpels will rupture in the spring while retaining their original position and enfolded by the persistent calyx.

The dehiscence of the carpels takes place along two sutures, a ventral and a dorsal. In the majority of the cases that have come under my observation the inner or ventral suture opens first, the fissure beginning near the apex or at the point of juncture of the carpels, and is complete from base to summit. The outer or dorsal suture opens immediately after the rupture of the inner, but the line of dehiscence extends across the top of the carpel only. Owing to this circumstance the carpel is never two-valved in dehisence, apparently a new character in our North American *Opulasters*, and therefore, clearly, to be considered as follicular. When the carpels are so firmly united that no lateral separation between them takes place the inner suture opens through both simultaneously.

JOHN B. LEIBERG.

HOPE, IDAHO, March 9th, 1895.

Two new mountain Plants.

By Merritt Lyndon Fernald.

ASTER HENDERSONI n sp.

Stem slender, 3 or 4 feet high, cinereous-pubescent, almost lanate, except toward the glabrate base, branching above the middle, the densely cienerous branches bearing single terminal heads, or themselves divided into naked or scarcely leafy branchlets; leaves thin, cinereous on both surfaces, especially on the mid-rib, or becoming glabrate above, the entire margins often ciliate; the upper cauline oblong or oblong-lanceolate, 2 or 3 inches long, with auricled clasping bases, the lower oblanceolate, conspicuously narrowed above the clasping bases, 4–6 inches long; leaves on the branchlets few, scarcely an inch long, often so few as to give the appearance of almost naked peduncles; heads large, an inch or two across, 4–6 lines high; involucre of two or three loose rows of cinereous linear-attenuate bracts, mostly herbaceous, but the inner sometimes scarious below, rarely with one two narrow foliaceous bracts; the fifty or more blue rays ½–¾ inch long, a line wide.

Collected by Prof. L. F. Henderson (No. 2798) in rich moist meadows along the St. Maries River, Kootenai county, Idaho, August 5, 1894.

Closely related to *puniceus* and *Cusickii.* The involucre is like the former, but the plant is more slender, with no trace of the stiff pubescence and harsh serrate leaves of that species, while the lower cauline leaves are contracted above the clasping bases as in *Cusickii. Hendersoni* has the same pubescence as *Cusickii* var. *Lyalli* Gray, but this latter plant has much broader leaves, and the outer bracts of the involucre are very broad and foliaceous, and, according to Prof. Henderson, it grows in more open and drier bottoms than the plant here described.

CAREX SCABRATA × CRINITA n. hyb.

Either stout or slender, the leaves and culm harsh as in *scabrata;* spikes 5–7, mostly androgynous, varying from ⅓ to 1½ inches in length, the upper nearly sessile, the lower on peduncles an inch or more long, slightly spreading; scales lanceolate or ovate-lanceolate, with brown scarious margins, and strong green mid-veins sometimes continued into rough awns 2–3 times as long as the perigynia, sometimes not equalling the perigynia; perigynia broadly ovate, with the few nerves either obscure or well marked, some of them puncticulate, others slightly puberulent; the beak short and entire.

Collected by Dr. Geo. G. Kennedy in a damp hollow near the Crawford Bridle Path, on Mt. Clinton, N. H., August 20, 1891.

Cryptogamic Notes from Long Island. III.

By SMITH ELY JELLIFFE, M. D.

DIATOMACEAE.

Amphora ovalis Kutz.
Cymbella Cistula Hempr.
Encyonema ventricosum Kutz.
Stauroneis acuta W. Sm.
Stauroneis anceps Ehrb.
Stauroneis gracilis Ehrb.
Stauroneis Phoenicenteron Ehrb.
Navicula Americana Ehrb.
Navicula ambigua Ehrb.
Navicula flamma A. Sch. var.
Navicula cuspidata Kutz.
Navicula dilatata Ehrb.
Navicula firma Kutz.
Navicula laevissima Kutz.
Navicula gibba (Kutz.) Ehrb.
Navicula Hitchcockii Ehrb.
Navicula apis Kutz.
Navicula lata Breb.
Navicula Lyra Ehrb.
Navicula major Kutz.
Navicula marina Ralfs.
Navicula radiosa Kutz.
Navicula rhyncocephala Kutz.
Navicula varians Greg.
Navicula viridis Kutz.
Pleurosigma angulatum W. Sm.
Pleurosigma Balticum W. Sm.
Pleurosigma elongatum W. Sm.
Pleurosigma Spencerii W. Sm.
Amphiprora ornata Bailey.
Gomphonema acuminatum Ehrb.
Gomphonema capitatum Ehrb.
Gomphonema constrictum Ehrb.
Rhoikosphenia curvata (Kutz.) Grun.
Achnanthes brevipes Ag.

Achnanthes longipes Ag.
Achnanthes subsessilis Ehrb.
Cocconeis Pedicularis Ehrb.
Cocconeis scutellum Ehrb.
Epithemia gibba (Ehrb.) Kutz.
Epithemia turgida (Ehrb.) Kutz.
Eunotia lunaris (Ehrb.) Grun.
Eunotia tridentula Ehrb.
Eunotia major (W. Sm.) Rab.
Synedra affinis Kutz.
Synedra fulgens (Kutz.) W. S.
Synedra pulchella Kutz.
Synedra longissima Kutz.
Synedra lanceolata Kutz.
Synedra Ulna (Nitzsch.) Ehrb.
Fragilaria capucina Desmaz.
Asterionella formosa Hass.
Meridion circulare Ag.
Tessela interrupta Ehrb. ?
Tabellaria fenestrata Kutz.
Tabellaria flocculosa (Roth.) Kutz.
Grammatophora marina Kutz.
Rhabdonema Adriaticum Kutz.
Cymatopleura elliptica (Breb.) W. Sm.
Cymatopleura Solea (Breb.) W. Sm.
Surirella elegans Ehrb.
Nitzschia fasciculata Grun.
Nitzschia gracilis Hautzsch.
Nitzschia scalaris (Ehrb.) W. Sm.
Nitzschia sigmoidea (Ehrb.) W. Sm,
Nitzschia tabellaria Grun.
Melosira Borrerii Grev.
Melosira granulata (Ehrb.) Ralfs.
Melosira varians Ag.
Biddulphia laevis Ehrb.
Biddulphia pulchella Gray.
Rhizosolenia gracilis H. L. S.
Triceratium alternans Bailey.
Eupodiscus radiatus Bailey.

Botanical Notes.

Hough's American Woods. Part VI. of this valuable series of thin sections of North American woods, together with the letter press to accompany Parts IV. and V., have recently been distributed to subscribers. The six parts now issued contain tangential, radial and transverse slices of 150 pieces of trees, and form an invaluable part of the equipment of any botanical museum. Cross sections of these woods mounted as lantern slides are also prepared by Mr. Hough. Descriptive matter and specimens of the work may be obtained from him by addressing R. B. Hough, Lowville, N. Y.

Photographs of Fungi. We have received from Mr. C. G. Lloyd, of Cincinnati, the first set of a series of photographs and photogravures of the larger fungi, prepared by him for distribution among a limited number of students. The execution of these photographs is excellent and they cannot fail to be of great aid to mycologists. The species are determined by Mr. A. P. Morgan, of Preston, Ohio. Mr. Lloyd informs us that the sets are not for sale.

Reviews.

Guide to the Study of common Plants. An Introduction to Botany. V. M. Spaulding. 2nd edition, pp. 287. Boston, D. C. Heath & Co. 1895.

The second edition differs from the first mainly in the addition of a glossary and index of botanical terms, an index of plant names, and a chapter on fungi.

The text has undergone some alterations and a number of additions have been made to the reviews and summaries at the ends of chapters. The chapter on Fruits has been completed by a few pages on "The Organs of Flowerless Plants."

The chapters on ferns and club mosses have been simplified by the omission of the anatomy and developmental history, although the latter reappears in a review and summary of the Vascular Cryptogams. Many additions have been made to the "special studies," particularly in the portion of the book devoted to the families of flowering plants. E. A. S.

A preliminary List of the Mosses of Minnesota. John M. Holzinger. (Minn. Bot. Studies, Bull. No. 9, March 5th, 1895).

This list includes 156 species, arranged according to Renauld and Cardot's list, with the addition of one new variety, *Amblyodon dealbatus* var. *Americanus*, R. & C. ined., which has been distributed as No. 180 of their Musci. Am. bor. Exsicc., with description and notes in their observations. These specimens should be compared with *M. Macounii* Aust. which has been referred to *Amblyodan dealbatus* in the Manual. *Gymnostomum curvirostrum* var. *scabrum* is also an addition to the flora, not having previously been reported. We find several typographical errors, one of which is guilty of making a synomym for *Coscinodon Raui*. We have two sets of specimens from the Bluffs at Winona, and have not found *C. Wrightii* among them, but *C. Raui* does occur, and the fact that M. Cardot has determined it as *C. Renauldi*, adds another point to my argument that the species are identical.

The citation of authorities for *Cynodontium Wahlenbergii* (Brid.) Hartm. is incorrectly given, and *Physcomitrium pyriforme* is listed on Cardot's determination. We have not yet seen an American specimen which agreed with this species, and the ones sent to us by M. Cardot bearing this name are not excepted. *Physcomitrella patens* (Hedw.) Br. & Sch. should be added as having been collected by Miss Sheldon at Fort Snelling, Minn., October, 1894.
E. G. B.

On new Species of Cretaceous Plants from Vancouver Island. J. W. Dawson. Trans. Roy. Soc Canada, sec. 4: 53–72. *pl. 5–14.* 1893.

In this paper are included descriptions of twenty-eight new species, some of which are, however, certainly referable to previously described species. The figures are poor and some of the material upon which new species are founded is too fragmentary to be satisfactory. In deference, doubtless, to certain critics of palaeobotany the author finds it advisable to use these words: "I think it proper to say that I cannot be expected to pledge myself for the accuracy of the generic names attached to mere leaves. When the fruit shall be found connected with them, they may require very different reference. At present they merely stand as forms of certain types characteristic of a certain geological age, and admitting of more or less accurate comparison with modern plants," which sentence he sums up quite concisely all that the palaeobotanists claims for his determinations. A chapter on the value of fossil plants as indices of climate in the past completes the paper.
A. H.

Field, Forest and Garden Botany, by Asa Gray, revised and extended by L. H. Bailey.

This once popular little manual, first published in 1869, had never been revised nor re-edited by its author, and, in conseqence, had, in time, lost much of its value and become somewhat obsolete. Prof. C. R. Barnes began a much needed revision which was later taken up and has just been successfully carried through by Prof. Bailey. Considering the nature of the task it is doubtful whether anybody else was as well equipped for it.

The reviser states that his first aim was to preserve, as far as possible, the method of the original, attempting " nothing more than to bring it down to date." The work, however, has been more thorough and extensive than those words would imply; not only were the nomenclature and definition corrected, but the analytical keys and grouping of species into sections have been rearranged and much new matter added, so that the original of 374 pages has been increased to 503 pages. The added matter consists of no less than 82 genera and 533 species, the total number of species being 3203, of which 1784 are indigenous and 1419 extra-limital (in cultivation). To give a few examples taken at random: *Clematis* has now 17 described species instead of 11 in the original; *Magnolia*, 8 species and hybrids instead of 3; *Brassica*, 8 instead of 5; *Tilia*, 6 instead of 3; *Prunus*, 29 instead of 19; *Pyrus*, 16 instead of 10; *Canna*, 11 instead of 5; Palms, 17 instead of 4, &c., and the quality has kept pace with the quantity. The typography is also very much improved, being even better than that of Gray's Manual, and, indeed, about as perfect as one could desire.

This book is intended to remain, as before, a companion to the Manual, and the nomenclature and definition are made to conform strictly with it; whatever shortcomings, therefore, the Manual is guilty of in these respects are shared by its companion work. A very welcome innovation is the citation of the authority after each name; this, in our day, has become a necessity in a work with any pretention to exactness.

As would be expected, special attention was devoted to cultivated plants, whether ornamental or useful, native or introduced; in this respect the revision is remarkably complete, including even such comparatively recent introductions as *Akebia quinata, Actinidia polygama, Solanum muricatum*, etc. It is not only the best, but, I may say, the only work descriptive of our domesticated flora. It will be heartily welcome by the many who have neither time nor facilities for the pure study of systematic botany, but who, nevertheless, love flowers and takes an intelligent interest in the wealth of decorative and useful plants which surround them on on all sides. V. H.

Pflanzenkrankheiten durch kryptogamen Parasiten verursacht Karl Freiherr von Tubeuf. Berlin, 1895.

This book is a condensed treatise on plant "parasitism" or "symbiosis" in its widest sense. Unfortunately the term plant-disease (Pflanzenkrankheit) is not defined, but the reader is led to assume that any change produced in a plant due to a "symbiotic" or "parasitic" relation with another plant is considered a plant disease.

The attempt is made to treat the physiological and morphological relations of parasitism from a comparative standpoint Physiological and anatomical details are not entered into as that would be both impossible and unnecessary because of the copious citations of special authors whom the specialist interested may consult. All the authorites quoted are recent and standard. With few exceptions the figures are excellent. The numerous photographs are especially interesting.

The student of general botany will no doubt find Part I. the most interesting. Here the author has very briefly outlined his conception of parasitism in the wider sense. Here he also shows his greatest originality. Especially interesting are his distinctions between *Mutualism* ("Mutualismus") and *Nutricism* ("Nutricismus"). By the former is meant that form of parasitism in which the two symbionts mutually benefit each other. As the most important examples are to be mentioned the lichens. Here two organisms, an alga and a fungus live together for mutual benefit. He emphasizes the fact that this symbiosis has so changed the life history of the two organisms that they combine to form a *new* organism. This union of two originally distinct organisms to form an independent organism he designates "*individualism.*" By nutricism is meant that form of parasitism in which one of the symbionts is not benefited because no assistance is required. As an example may be mentioned the *mycorhiza* of certain trees and the *mycodomatiae* (rhizobia) of Leguminosae. Here the author supposes that the infecting fungus works in the interest of the plant infected without receiving any benefit in return.

In Part I. are also given various approved methods and means for guarding against infection of pernicious parasites and how to to destroy them after infection has taken place.

Part II., which is by far the most extensive, treats of "phytopathogenic fungi and algae." It is essentially a systematic description of the infecting fungi and algae based upon the most recent investigations and conclusions.

Taken all in all, this work is certainly a most valuable contribution to the science of botany. It will prove of great benefit to all botanists. The condensed retrospect of the subject will suffice for the general student, while the citations will be found very useful by the special student.

Language and style are scientifically clear and simple. Only a a few of the figures are borrowed. ALBERT SCHNEIDER.

A Monograph of the North American Species of the Genus Polygonum, by John Kunkel Small. This work, a folio of 183 pages (not counting the plates), was issued on the 23d of April, 1895, as the first volume of Memoirs from the Department of Botany of Columbia College.

In the introduction, after discussing the position of the family to which it has given a name, the relation of the genus *Polygonum* to its allies is taken up and considered. Then follow chapters on the geographical distribution of the species, the general morphology of the genus, the anatomy of the stem and general anatomy.

Natural and distinct as the genus appears, it admits of division into well-marked sub-genera, nine of which contain representatives in the New World, viz.: Bistorta, Aconogonon, Persicaria, Amblyogon, Tovaria, Avicularia, Duravia, Tiniaria and Echinocaulon. These, as described and figured by Dr. Small, including a fossil species from the Miocene Tertiary of Colorado, number 71. Each of them is illustrated by an uncolored outline-drawing on a separate sheet, so admirably executed as to make the salient characters clear to the eye, and the descriptions on the opposite pages are models for their terse and accurate use of botanical terminology.

The new species, 9 in all and the varieties 8, form a large addition to the genus.

The latter part of the volume is devoted to the comparative anatomy of the stems of certain species, accompanied by 15 excellent plates, which exhibit such diversities of internal structure as to afford essential aid in support of sub-generic and even specific distinctions.

To withhold recognition, so fairly earned and so worthy of acknowledgment, from a work like this would be wrong. It is highly creditable both to the author and to the college whose ample resources and friendly help enabled him to produce it. The fruit, not of a hasty and rapid incursion, but of persistent, patient and thorough study of the field which it covers, the contribution it has made to science is solid and will endure. What Dr. Engelmann did for *Juncus* has now been done for *Polygonum*, and more of just this kind of labor is needed for the better elucidation of our North American Flora. T. C. P.

Proceedings of the Club.

TUESDAY EVENING, MAY 14TH, 1895.

The President in the chair and 22 persons present.

Mr. A. Ruth and Mr. W. A. Bastedo were elected active members.

The editor announced the publication of the third part of Vol. 4 of the MEMOIRS, and stated that the fourth part would contain a paper by Mrs. Pettit on *Arachis hypogaea*.

Mr. Lighthipe reported excellent progress in the rearrangement of the herbarium.

The announced papers of the evening were then presented.

1. By Mr. George V. Nash, "The North American Species of the Genus *Cenchrus*," illustrated by specimens.

2. By Mrs. Anna S. Pettit, "Notes from a Study of the Peanut, *Arachis hypogaea*."

Dr. N. L. Britton exhibited a series of lantern-slides of cross-sections of North American Woods, prepared by Mr. R. B. Hough.

WEDNESDAY EVENING, MAY 29TH, 1895.

Vice-President Lighthipe in the chair and 32 persons present.

Miss Rose T. Roux, Mr. James A. Graves and Mr. Frederick King Vreeland were elected active members.

Mr. Barnhart reported the occurrence of *Azalea lutea* L. (*A. calendulacea* Michx.) in an apparently native state near Tarrytown, N. Y., and remarked on the distribution of this species, which is not recorded in recent writings from further northeast than the mountains of Pennsylvania. Dr. Britton called the attention of the Club to the recorded occurrence of a yellow-flowered *Azalea* in southern New York by Governor Cadwallader Colden about the middle of the last century, and that Colden's account of it had been made a part of the citations by Linnaeus of his *Azalea lutea* in 1753. Linnaeus later abandoned the name *lutea* on account of having received specimens of the pink-flowered species which he described as *A. nudiflora* in 1762, supposing them to be the same. Mr. Barnhart's discovery is an interesting confirmation of the position taken in the recently issued "List of Northeastern North American Plants" that the name *A. lutea* L. must replace *A. calendulacea* Michx.

Mr. Barnhart also reported that *Alliaria Alliaria*, found by him last year at Hastings, N. Y., had this year spread over a considerable area and was well established.

The announced paper of the evening was read by Mr. A. A. Tyler on "Stipules in the Family Rosaceae," illustrated by specimens and drawings. It was discussed by Dr. Schneider and Dr. Britton.

The Club then adjourned to the second Tuesday evening in October.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 22. Lancaster, Pa., July 31, 1895. No. 7.

Some new and rare Desmids of the United States.—II.

By L. N. Johnson.

(Plates 232, 233.)

Since the publication of the first paper of this series[1] I have examined a number of collections of desmid-bearing material from various parts of the country. The results of this examination have been to extend very greatly the known range of many species, and to add more than a score to the number reported from the United States by previous writers. Many species are still undetermined and held for further study. Material is also being accumulated which will illustrate the great variability of many species, but this subject will be discussed at another time.

The present paper is based on collections made in New Hampshire, Connecticut, New York, North Carolina, Florida, Louisiana, Michigan, Kansas and California. From some of these States material representing several localities has been examined. I wish to acknowledge my indebtedness to the friends who have responded so kindly to my request for material, and to Prof. Nordstedt, who has aided me greatly by his criticism and advice.

I have thought it best to make one change in the manner of reporting additions to our flora. After every such species is given a number in parenthesis. This refers to a numbered specimen in my herbarium. Thus if any species is incorrectly determined it will be possible to see the particular specimen on which the report was based.

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[1] Bulletin of Torrey Botanical Club, 21: 285. Je. 1894.

The limits of genera among desmids are so unsettled that hardly any two writers agree in all points. Especially is this true of the genus *Cosmarium*. No attempt has been made to settle the points in dispute. In nearly every case the specimens have been compared with the original figures and descriptions. Where the variation from the type is slight varietal names have not been used, as it seems useless to encumber our literature with a long list of varieties, many of which represent simply forms of a variable species.

In the enumeration of species only the more noteworthy ones from the various localities are mentioned, although careful record has been made of all species observed, and specimens have been preserved. Species new to the United States are marked with an asterisk.

Pleurotaenium nodosum (Bail.) Lund. Near Tallahassee, Fla. Scarce. Surface of cell smooth; ends ornamented with a circle of conical-rounded granules.

Docidium verrucosum (Bail.) Ralfs. Frequent in various collections from Florida. Walle's figures do not give a correct idea of this beautiful species. The elevations are nearly square, except those of the terminal circle, which are elongated. The apex of the semi-cell bears a crown of rounded granules. The Florida specimens resemble the figures of Joshua's *D. tessellatum*[2], and it seems to me that the latter must be regarded as a synonym of *D. verrucosum.*

D. coronulatum Grün. Occasional at Meredith, N. H. Several cells were often found joined in series. Diam.=25–35 μ.

This is apparently the same species figured by Wolle under this name. Grünow's original measurements are larger, and the cells as figured by him were slightly different in shape.

Penium annulare West. Baton Rouge, La. Frequent. Found by W. West in material from Maine, and described by him[3]. The present discovery extends its range more than a thousand miles. My specimens agree with his description, except that the undulations are less numerous and the cells rather shorter. Diam.=20 μ; length=110 μ. Fig. 1.

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[2] Joshua, W. Burmese Desmidieae, with descriptions of new species occurring in the neighborhood of Rangoon. Journ. Linn. Soc. **21** : 650. *pl. 25. f. 15.* Je. 1886.

[3] West, W. The Freshwater Algae of Maine. Repr. from Journal of Botany 1894: (2) *pl. 315. f. 5.6.* D. 1891.

* *P. Cylindrus* (Ehrb.) Breb. var. *Silesiacum* Kirch. (532). Wake Forest, N. C. Scarce. Agrees well with the description. Diam. =14 μ; length=42 μ. Fig. 2.

Closterium maculatum Hast. Bridgeport, Conn. Rare. Nearly twice as large as Hastings' measuremcnts, but otherwise agreeing with his description. Striae of minute granules and interrupted irregularly. Diam.=50 μ. Prof. Nordstedt suggests that this species may possibly be a form of *Cl. areolatum* Wood. Fig. 7.

Cl. angustatum Kütz., var. *clavatum* Hast. Bridgeport, Conn. Scarce. Diam.=25 μ. This seems well marked, but only a few specimens were found. Fig. 6.

* *Cl. abruptum* West. (395). Holderness, N. H. Frequent. Variable in length. Occasionally a specimen is longer than West's measurements. Diam.=12 μ; length=84–200 μ. Fig. 5.

* *Cl. Cynthia* De Not. (537). Wake Forest, N. C. Frequent and typical. Striae very fine and numerous. Diam.=12–14 μ; length=100–120 μ. Fig. 3.

Cl. tumidum nov. nom. (416). (*Cl. Cornu* β of Ralfs.[4]; Cl. cornu of Wille[5], but not of Ehrenberg[6]). Burlington, Kansas. Frequent. Diam. usually 12 μ; length=116–120 μ. Occasionally a specimen reaches a diameter of 18–20 μ, representing Wille's forma *major*[5]. West found the latter in Maine. Fig. 4.

Gonatozygon aculeatum Hast. Meredith, N. H. Occasional. Seems to be a well-marked species. Diam.=16 μ; length 300 μ. Aculeae 6–8 μ long. Fig. 9.

G. asperum (Breb.) Cleve. (460). Tallahassee, Fla. Rare. West reports it from Maine. The single specimen found was about twice as long as the type, but otherwise the same. Diam.=6 μ; length=260 μ. Fig. 8.

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[4] Ralfs, J. British Desmids. 176. *pl. 30. f. 6 a and b.* 1848.

[5] Wille, N. Ferskvandsalger fra Novaja Semlya. Öfversigt af Kongl. Vetenskaps. Akademiens Forhandlingar, 1879, *pl. 14. f, 80,81.* 1879.

[6] Ehrenberg, C. G. Die Infusionsthierchen als volkommene Organismen. 94. *pl. 6. f. 5.* 1838.

Micrasterias Nordstedtiana Wolle. Meredith, N. H. Rare. Diam.$=170\ \mu$. These specimens differ from Wolle's description and figures in that the lobes terminate in two spines instead of three or more. The end lobe is not so emarginate, and the projection on the sides of the neck is larger and nearly cylindrical, ending in two spines. Fig. 14.

M. Mahabuleshwarsensis Hobs. Meredith, N. H. Rare. In same material as the preceding. Rays more slender than in Wolle's figure.

* *Euastrum Sibiricum* Boldt (568). Duval county, Florida. Agrees well with Boldt's description and figures. Diam.$=18\mu$; length$=20\mu$; thick.$=11\mu$. It is interesting to find this Siberian species in Florida. Probably it will be found to have a wide distribution, escaping notice because of its small size. Fig. 13.

Dysphinctium viride (Corda) De Toni. (*Cosmarium Cordanum* (Breb.) Wolle.; Desmids of U. S. 1892 edition). Reported from Nova Scotia, and by West from Massachusetts. I find it common in material from Bridgeport, Conn., and Staten Island and Ithaca, N. Y. Diam.$=26\mu$.

Cosmarium amoenum Breb. Frequent in collections from Florida, and from Meredith, N. H. Typical.

C. cyclicum Lund. Meredith, N. H. The specimens come close to var. *subtruncatum* Hansg.

C. elegantissimum Lund. Duval county, Fla., and Meredith, N. H. The specimens resemble Lundell's figure[7], though the granules are most commonly only faintly emarginate. Wolle's figures are singularly incorrect in showing a deep linear sinus, though he describes it correctly in this particular. Usually about seven longitudinal rows of granules are visible at once in front view. Diam.$=22\mu$; length$=50\mu$. Fig. 27.

C. Minneapolitanum Hansg. (*C. protuberans* Lund. var. *granulatum* Wolle) (489). Ithaca, N. Y. Rather larger than Wolle's specimens (diam.$=34$–$36\ \mu$), but similar in form.

C. margaritatum (Lund.) Roy and Bissett (388). Meredith, N. H. Rare. The drawing does not show the granules well. They should be much larger and closer together. The position of the hyaline punctations is difficult to make out. They seem to be between the granules in the longitudinal rows. Diam.=72 μ; length =90 μ. Fig. 32.

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[7] Lundell, P. M. De Desmidiaceis quae in Suaecia inventae sunt. 53. *pl. 3. f. 20.* 1871.

C. pseudoprotuberans Kirch. New Baltimore, Mich. Rare. Typical. Diam.=32 μ; length=36 μ; isth.=10 μ. West reports this from Maine. Fig. 24.

* *C. costatum* Nordst. (522.) Wake Forest, N. C. Scarce. Diam.=32 μ; length=42 μ; thick.=21 μ; isth.=12 μ. This bears some resemblance to *C. sub-speciosum* var. *validius* Nordst., but is much smaller and with less numerous and larger crenae on the margin. Fig. 31.

* *C. Gotlandicum* Wittr. Burlington, Kans. Occasional. Diam.=28 μ; length=36 μ; isth.=9μ. This may be the same as *C. rectangulare* Grun. (in Rab. Fl. Eur. Alg.), and in that case the latter name should prevail by the right of priority, but it seems to me that the identity of the two is not positively proven. This is reported as occurring in Nebraska[8]. Fig. 26.

* *C. granatum* Breb. var. *sub-granatum* Nordst. (341.) Ann Arbor, Mich. Occasional. Diam.=25 μ; length=36 μ; isth.= 8 μ. Fig. 16.

* *C. Paulense* (Börgesen). (*C. polymorphum* Nordst. subsp. *Paulense* Börgesen). 277. Duval Co., Fla. Scarce. At the suggestion of Prof. Nordstedt I raise this to specific rank, as it seems to differ sufficiently from *C. polymorphum* Nordst. Diam.=36 μ; length=50 μ; isth.=10 μ. Slightly smaller than Börgesen's specimens and differing slightly in the position of the granules, but seemingly not distinct. In very clear specimens one can see that the wall is hyaline punctate between the five large granules on the front. Fig. 17.

* *C. pericymatium* Nordst. (445). Ithaca, N. Y. Occasional. Differing from Nordstedt's figures[9] in its deeper constriction in side view, but otherwise the same. Diam.=28μ; length=50μ; thick=26μ; isth.=24μ. Fig. 28.

* *C. porrectum* Nordst. (360.) Burlington, Kans. Frequent.

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[8] Contr. from Bot. Dept. of Univ. of Nebraska. New Series III. 46. 14 Je. 1892.

[9] Nordstedt, O. Desmidieae Arctoae. Öfvers. K. Vet. Akad. Forh. 1875: *pl. 7. f. 26.* 1875.

Slightly smaller than the original specimens from Brazil. Diam. $=50\mu$; length$=50\mu$; isth.$=13\mu$. Fig. 30.

* *C. quadrum* Lund. forma. (359.) Plymouth, N. H. Seems to be near var. *minus* Nordst. Semi-cells decidedly reniform at base; sometimes slightly retuse at the apex. Diam.$=40\mu$; length$=44\mu$; isth.$=14\mu$. Fig. 22.

* *C. Raciborskii* Lagerh. (365.) Meredith, N. H. Very rare. The membrane seems faintly granulate in the upper part of the semi-cell, but as the granules were not distinct they were not shown in the drawing. This agrees with the type in shape and surface, but differs slightly in the inner part of the sinus. Diam. $=50\mu$; length$=44\mu$; isth.$=21\mu$. Fig. 20.

* *C. subspeciosum* var. *validius* Nordst. (433.) Whitmore Lake, Michigan. Occasional. Diam.$=48\mu$; length$=62\mu$; isth.$=14\mu$. Differs from the original description in having seven vertical rows of granules on the inflation and in the fact that they are in more or less definite horizontal rows also. This hardly seems sufficient ground for separating it as a new variety. Fig. 33.

**C. synostegos* Schaarschm. (437). Bridgeport, Conn., and Sisson, Cal. Common but very minute. The specimens from Bridgeport average 10μ in diameter, the others 8μ with length$=11\mu$, thick$=5\mu$. The angles in the Californian specimens do not appear cuspidate. In most cases the sinus gapes little, if at all. This may prove to be a distinct species. Fig. 29.

**C. tetragonum* Naeg. var. *Lundellii* Cke. (512). Ithaca, N. Y. Occasional. Diam.$=24\mu$; length$=42\mu$; th.$=16\mu$. Fig. 21.

**C. Turpini* Breb. var. *podolicum* Gutw. (346). Baton Rouge, La. Slightly smaller than Gutwinski's measurements, but otherwise the same. Diam.$=40\mu$; length$=46\mu$; th.$=26\mu$ isth.$=12\mu$. Fig. 18.

Staurastrum brachiatum Ralfs. Duval Co., Fla. Rare.

St. brevispinum Breb. Staten Island, N. Y., and Sisson, Cal. Frequent.

St. commutatum Kütz. (349). Duval Co., Fla. Rare.

St. grande Bulnh. Bridgeport, Conn., and Meredith, N. H. Diam.$=68$–78μ.

St. trihedrale Wolle. Frequent in collections from Florida, also from Staten Island and Ithaca, N. Y. Diam.$=28$–30μ.

Apex of semi-cell sometimes shows three slight elevations corresponding to the three lobes.

ST. PROTRACTUM nov. nom. (*St. grallatorium* forma Wolle[10]) (428). This is certainly not a form of *St. grallatorium.* Wolle gives no note on it, but merely figures it. It may be described as follows: Length slightly less than breadth. Sinus shallow, linear, gaping widely in the outer half. Semicells nearly square with basal angles rounded and armed with two minute spines. Sides nearly parallel. Near the apex each is produced into a stout serrate ray tipped with three spines. Apex of semi-cell truncate, projecting above the rays and bearing several serrations. End view triangular, sides concave, angles drawn out into rays. Surface marked by several rows of serrations. Around the centre of the semi-cell (in end view) six larger bifid or trifid projections. Diam.=50–52 μ; length=44 μ. Whitmore Lake, Mich. Fig. 35.

* *St. leve* Ralfs. (450). Whitmore Lake, Mich. Frequent. Diam.=14 μ; length=18 μ. Fig. 34.

De Toni cites among the localities for this species "Americae borealis (Wolle),[11]" but I cannot find that Wolle ever reported it, and believe this must be a mistake.

* *St. Reinschii* Roy (348). Duval county, Fla. This does not agree exactly with Roy's description, but it comes so near it that I place it here provisionally. The spines are short but distinct. It is smaller than the type. Diam.=24 μ; length=20 μ. Fig. 15

* *Xanthidium antilopaeum* Kütz. forma *Javanicum* Nordst. (324). Ann Arbor, Mich. Diam.=52 μ; length=52 μ; thick.=30 μ; isth. =12 μ. The position and number of spines on the end of the semi-cell is variable, even in the same individual, but they show a tendency to arrangement in a single series. Fig. 10.

X. concinnum Arch. var. *Boldtianum* West. (422). (*Arthrodesmus hexagonus* forma Boldt.)[12] Duval county, Fla. Occasional. Very minute. Diam.=12 μ; length=14 μ; thick=6 μ; isth.= 4 μ. Nearly like Boldt.'s Fig. 17, but with sharper angles. In front view this looks like an Arthrodesmus, but in vertical view it shows a marked papilla on each side. It seems to be truly a *Xanthidium*.

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[10] Wolle, F. Desmids of the United States. *pl. 57. f. 20.21.* 1892.

[11] De Toni, J. B. Sylloge Chlorophycearum omnium hucusque cognitarum. 1227. 1889.

[12] Boldt, R. Bidrag till Kännedomen om Sibiriens Chlorophyllophyceer. Öfvers. K. Vet. Akad. Förh. 1885: 109. *pl.* 5. *f. 17.* 1885.

X. Tylerianum West. (*X. antilopaeum* Kütz. var. *truncatum* Hast. Wolle in Desmids of the U. S. 1892 edition.) Ithaca, N. Y. Common and typical. Although first described by Hastings, West's name must take precedence, since Hastings published the species merely in a local newspaper.

The following species are believed to be new:

ARTHRODESMUS MICHIGANENSIS n. sp. Fig. 12.

Size medium. Length about one-third greater than breadth. Sinus gaping, broadly rounded, semi-cells being connected by a short neck. Semi-cells sub-elliptical, with the apex of the cell drawn out into a broad truncated lobe, and each end armed with a long slightly recurved spine. In vertical view rhombic elliptical with a long spine at each end. Side view circular. Diam.=24-30 μ; length=36-40 μ; thick=16-18 μ; isth.=7-9 μ. Whitmore Lake, Mich. Frequent. Type in herb. Johnson, 427.

COSMOCLADIUM TUMIDUM n. sp. Fig. 23.

Minute. Length and breadth nearly equal. Cells usually joined in fours by a hyaline, mostly unbranched filament. Greatest diameter of cell placed at right angles to the connecting filaments. Sinus deep, linear; semi-cells hexagonal elliptic, with apex flattened. In vertical view elliptical with slight but distinct median inflation. Side view nearly circular. Diam.=8 μ; length =9 μ; thick=5 μ; isth.=2 μ. Whitmore Lake, Mich. Type in herb. Johnson, 455.

This resembles *C. subramosum* Schmidle, but differs from it in its shorter cell, and in the median inflation of the semi-cell.

I do not feel perfectly sure that *Cosmocladium* should be separated from *Cosmarium*.

COSMARIUM PACIFICUM n. sp. Fig. 25.

Small. Length about one-fourth greater than the breadth. Sinus strongly gaping. Isthmus narrow. Semi-cells sub-elliptical. Sides curving regularly from the base to above the middle, then converging by a sharp angle to form the rounded end. End view elliptical, with no inflation. Side view nearly circular. A single pyrenoid in each semi-cell. Membrane punctate. Diam. =25-28 μ; length=32-34 μ; thick=15-17 μ; isth.=6 μ. Sisson, Siskiyou county, California. Altitude 3000 feet. M. A. Howe coll. Type in herb. Johnson, 402.

This resembles *Staurastrum bienianum* Rabh. var. *connectens* Boldt, but is much smaller, and lacks the short spines near the base of the semi-cells. It seems to be a true Cosmarium. It resembles *C. inflatum* Wolle, differing chiefly in length of cell and curvature of the sides. Wolle's figures are not always accurate, and it may be that this is a form of his species.

COSMARIUM DISPERSUM n. sp. Fig. 19.

Size, medium. Length and breadth about equal. Sinus deep, narrowly linear. Semi-cells semi-circular, with the apex sometimes slightly flattened. Margin gently undulate with about eighteen elevations, often less distinct toward the apex. End view elliptical; side view nearly circular. Two pyrenoids in each semi-cell. Membrane finely punctate. Diam.=40–44 μ; length=40 μ; thick.=20 μ; isth.=11 μ. Found in material from Baton Rouge, La., and from Meredith, N. H., at about the same time. Type (from Louisiana) in herb. Johnson, 347.

BOTANICAL LABORATORY, UNIV. OF MICHIGAN.

Description of Plates 232 and 233.

(Reduced one-fourth in Photographing.)

a=front view, *b*=vertical view, *c*=side view of cell.

1. *Penium annulare* West × 560.
2. *P. cylindrus* (Ehrb.) Breb., var. *Silesiacum* Kirch. × 750.
3. *Closterium Cynthia* De Not. × 560.
4. *C. tumidum* nov. nom. × 560.
5. *C. abruptum* West × 560.
6. *C. angustatum* Kütz., var. *clavatum* Hast. × 320.
7. *C. maculatum* Hast. × 320 (a semi-cell).
8. *Gonatozygon asperum* (Breb.) Cleve. × 320, *a* × 750.
9. *G. aculeatum* Hast. × 320.
10. *Xanthidium antilopaeum* Kütz. forma *Javanicum* Nordst. × 560.
11. *X. concinnum* Arch., var. *Boldtianum* West. × 750.
12. *Arthrodesmus Michiganensis*, n. sp. × 560.
13. *Euastrum Sibiricum* Boldt. × 750.
14. *Micrasterias Nordstediana* Wolle. × 320.
15. *Staurastum Reinschii* Roy. × 750.
16. *Cosmarium granatum* Breb., var. *subgranatum* Nordst. × 560.
17. *C. Paulense* (Börgesen). × 750.
18. *C. Turpini* Breb., var. *podolicum* Gutw. × 750.
19. *C. dispersum* n. sp. × 750.
20. *C. Raciborskii* Lagerh. × 750.
21. *C. tetragonum* Naeg., var. *Lundellii* Cke. × 750.
22. *C. quadrum* Lund. forma. × 750.

23. *Cosmocladium tumidum* n. sp. × 750.
24. *Cosmarium pseudoprotuberans* Kirch. × 750.
25. *C. Pacificum* n. sp. × 750.
26. *C. Gotlandicum* Wittr. × 750.
27. *C. elegantissimum* Lund. × 750.
28. *C. pericymatium* Nordst. × 750.
29. *C. synostegos* Schaarschm. × 750.
30. *C. porrectum* Nordst. × 560.
31. *C. costatum* Nordst. × 750.
32. *C. margaritatum* (Lund.) Roy and Bissett. × 560.
33. *C. subspeciosum* var. *validius* Nordst. × 750.
34. *Staurastrum leve* Ralfs. × 750.
35. *S. protractum* nov. nom. × 560.

The Genus Cenchrus in North America.

BY GEO. V. NASH.

Cenchrus is a small genus of grasses containing about a dozen species, found principally in tropical and sub-tropical regions. In the United States it extends into the temperate zone. One species, *C. tribuloides*, the common bur-grass, occurs frequently in sandy soil along river banks, and has a very wide distribution, extending from Massachusetts to Ontario, Minnesota and Nebraska, south to Mexico. It is also found in South America and in Cuba. The other species occurring in the United States are confined to the southern parts of the country, one, *C. echinatus*, extending as far north as North Carolina.

The genus in the United States is readily divided into two well-marked groups, the first containing those forms in which the involucre consists of two spine-bearing valves, more or less concealing and enclosing the 2–6 spikelets, as illustrated in the common *C. tribuloides;* the second has only one species, the involucre consisting of 2–4 rows of erect bristles, the outer shorter than the inner, the single spikelet merely surrounded by the bristles and not enclosed. The single species belonging to this group is *C. myosuroides*, which ranges from Georgia and Florida to Texas, and south through Mexico to South America, where it is very common.

Key to the Species.

Involucre consisting of two spine-bearing valves, enclosing the 2–6 spikelets.
  Involucre armed at base.
    With shorter, generally reflexed spines; pedicels smooth; involucre 2-flowered.
      Involucre globose, pubescent. 1. *C. tribuloides.*
      Involucre ovate, smooth, 2. *C. gracillimus.*
    With erect barbed bristles; pedicels villous; involucre 4–6 flowered. 3. *C. echinatus.*
  Involucre naked at base. 4. *C. incertus.*
Involucre consisting of 2–4 rows of erect slender spines and bristles, at the base of the single spikelet. 5. *C. myosuroides.*

1. CENCHRUS TRIBULOIDES L. Sp. Pl. 1050. 1753.

C. Carolinianus Walt. Fl. Car. 79. 1788. Teste Pursh.

Stems erect or ascending, generally decumbent at base, robust, 2–6 dm. long, branching freely, sheaths generally strongly inflated, smooth, striate, compressed, the lower ones overlapping, the upper shorter than internodes, 3–8 cm. long; leaves 6–12 cm. long, 4–8 mm. wide, smooth or scabrous, flat or slightly complanate; spikes 3–6 cm. long, generally partially included in upper sheaths, densely 6–20-flowered; internodes of scabrous rachis 3–5 mm. long; involucre 2-flowered, globose, pubescent to villous, yellowish to light green in color, smooth at base, spines 3–4 mm. long, slightly to strongly ciliate at base, acutely barbulate at apex; spikelets 6–7 mm. long, generally not exserted beyond the involucre; 1st glume hyaline, triangular, acute, about one-half as long as spikelet, sparingly scabrous, strongly 1-nerved; 2d glume of firm texture, ovate, obtuse, about three-fourths as long as spikelet, scabrous, faintly 5-nerved at base, strongly so at apex; 3d glume firm, ovate, somewhat acute, about equaling spikelet, scabrous, 5-nerved; 4th glume chartaceous, broadly ovate, acuminate, 5–7 mm. long, scabrous at apex, 5-nerved; palet of first flower about as long as glume, 2-nerved, strongly scabrous between the nerves especially toward the apex, empty or enclosing 3 stamens; palet of perfect flower chartaceous, broadly ovate, slightly shorter than glume, faintly 2-nerved, scabrous toward the apex; seed oblong-obovate, 3 mm. long, 2–2.5 mm. broad, compressed.

Extensively distributed in the United States ranging from Massachusetts to Ontario, Minnesota and Nebraska, south to Florida and Mexico. Extremely variable, but its robust habit, generally strongly inflated sheaths and light colored globose involucres will distinguish it from its nearest relatives.

2. CENCHRUS GRACILLIMUS n. sp.

Stems ascending or erect, 3–6 dm. high, simple or occasionally sparingly branched above, slender; sheaths smooth, striate, the lower overlapping, the upper shorter than internodes, 6–7 cm. long, but slightly inflated; leaves complanate, 5–8 cm. long, about 2 mm. broad, acuminate, scabrous on margins and mid-nerve; spike finally long-exserted, 3–5 cm. long, loosely 3–6 flowered, internodes of scabrous rachis about 1 cm. long; involucre 2-flowered, smooth, ovate, purplish, deeply furrowed and smooth at base; spines purple, 5–6 mm. long, 1 mm. broad at base where they are sometimes ciliate, acutely barbulate at the apex; spikelets about 8 mm. long, exserted beyond involucre for one-third to one-half their length; 1st glume triangular, hyaline, acute, one-half as long as spikelet, strongly 1-nerved, slightly scabrous; 2d glume firm, ovate, acute, 7-nerved, scabrous; 3d glume of firm texture, ovate-lanceolate, acuminate, slightly shorter than spikelet, 5-nerved, scabrous especially toward apex; 4th glume chartaceous, 7–8 mm. long, ovate-lanceolate, long-acuminate, strongly 5-nerved at apex, scabrous for upper half; palet of first flower equaling glume, strongly scabrous, 2-nerved, empty or enclosing three stamens; palet of perfect flower ovate, long-acuminate, chartaceous, a little shorter than glume, 2-nerved, strongly scabrous toward apex; seed oblong, 2.5 mm. long, 1.5 mm. broad.

Florida, occurring in the high pine land, together with *C. tribuloides* and *C. echinatus*, flowering a little earlier than the former and later than the latter. It is readily distinguishable from either, especially when growing in the field, by its long slender purple spines, smooth involucre, very slender habit and closely complanate leaves. Begins to flower early in April. My Nos. 188 and 288, collection of 1894.

3. CENCHRUS ECHINATUS L. Sp. Pl. 1050. 1753.

Stems creeping, erect, 3–6 dm. long, branching; sheaths smooth, striate, inflated, lower ones overlapping, upper shorter than internodes, 8–12 cm. long; leaves 1–4 dm. long, 5–15 mm. wide, smooth or scabrous, flat; spikes 4–12 cm. long, finally more or less exserted, very densely 20–50 flowered, internodes of the scabrous rachis 2–3 mm. long; involucre 4–6 flowered, globose, green to purplish, more or less pubescent, villous at base; spines 3–4 mm. long, barbulate at apex, more or less ciliate at base; bristles at base of involucre numerous, slender, distinctly barbed for their whole length; spikelets 6–7 mm. long, more or less exserted from involucre; 1st glume hyaline, lanceolate, obtuse or acute, one-half as long as spikelet, strongly 1-nerved, sparingly scabrous at apex;

2d glume firm, ovate, obtuse, three-fourths as long as spikelet, 5-nerved, scabrous; 3d glume firm, ovate-lanceolate, acuminate, slightly exceeded by fourth glume, 5-nerved, scabrous; 4th glume chartaceous, ovate-lanceolate, acuminate, 6–7 mm. long, 5-nerved, scabrous at apex; palet of first flower about as long as glume, 2-nerved, strongly scabrous; palet of perfect flower as long as glume, chartaceous, ovate-lanceolate, faintly 2-nerved; seed obovate to elliptical, 2.5 mm. long, 1.5 mm. wide, compressed.

This plant is well marked by its broad flat leaves, and the slender barbed bristles surrounding the base of the involucre, which contains double the number of spikelets found in the other species.

North Carolina to Texas, along the coast.

4. CENCHRUS INCERTUS M. A. Curtis, Bost. Journ. Nat. Hist. **1**: 135. 1837.

Stems erect or decumbent at base when young, finally creeping, 3–6 dm. long, smooth; sheaths smooth, inflated, compressed, striate, lower ones more or less overlapping, upper shorter than internodes, 5–9 cm. long; leaves smooth, flat, 4–15 cm. long, 3–5 mm. wide; spike generally exserted, 3–6 cm. long, 8–20-flowered, internodes of the scabrous rachis 2–5 mm. long; involucre 2-flowered, pubescent, ovoid, smooth at base; spines about 3 mm. long, very broad at base, ciliate; spikelets 5 mm. long, more or less exserted from involucre; 1st glume hyaline, triangular, acute, strongly 1-nerved, one-half as long as spikelet; 2d glume of firm texture, ovate, obtuse, about three-fourths as long as spikelet, 5–7-nerved, scabrous; 3d glume ovate, acute, 5-nerved, somewhat shorter than fourth glume, scabrous; 4th glume chartaceous, broadly ovate, acute, about 5 mm. long, strongly 5-nerved and scabrous at apex; palet of first flower about equaling glume, strongly scabrous, 2-nerved, empty or enclosing three stamens; palet of perfect flower chartaceous, ovate, acute, about equaling glume, scabrous at apex; seed oval, 2 mm. long, 1.5 mm. broad.

Ranges from South Carolina to Florida and Texas. The smaller involucre, naked at base, with fewer and shorter spines, readily distinguish this plant from *C. tribuloides* which it somewhat resembles.

5. CENCHRUS MYOSUROIDES H. B. K. Nov. Gen. **1**: 115. 1815.

Panicum cenchroides Ell. Bot. S. C. and Ga. **1**: 111. 1817.

Perennial from a running rootstock. Stems 6–14 dm. high, simple, or branched above, terete, smooth; sheaths somewhat inflated, 7–14 cm. long, striate; leaves smooth, 1–3 dm. long, 3–8 mm. wide; spikes included in upper sheath, or more or less exserted, densely many-flowered, 5–20 cm. long, internodes of the scabrous rachis 2–5 mm. long; involucre consisting of 1–2 rows of barbed spines as long as the spikelet, subtended by 1–2 rows of barbed bristles one-fourth to one-half as long; spikelet about 5 mm. long, resting on the involucre and equaling its spines; glumes all more less short-pointed by the excurrent midnerve; 1st glume hyaline, triangular, acute, about one-half as long as spikelet, 1-nerved; 2d glume firm, ovate, acute, about three-fourths as long as spikelet, 5-nerved, sparingly scabrous; 3d glume as long as the fourth, firm, ovate, acute, strongly 5-nerved at apex; 4th glume chartaceous, ovate, acute, 5 mm. long, 5-nerved at apex; palet of first flower from one-quarter to one-half as long as glume; palet of perfect flower equaling glume, strongly 2-nerved and scabrous at apex.

Ranges from Georgia (Elliott) to South Florida, western Texas and Mexico.

Juncus scirpoides and its immediate Relatives.

By Frederick Vernon Coville.

In the year 1868 Dr. Engelmann grouped under *Juncus scirpoides* several closely related plants which, from the data now at hand, seem to require separation into four species. In 1880 Dr. Franz Buchenau described one of these as *J. Engelmanni*, and in 1890 another as *J. crassifolius.* I am now convinced that still another should be separated specifically under the name of *J. megacephalus*, published sixty years ago by M. A. Curtis, of Wilmington, North Carolina.

After examining the earlier literature of these plants it has been found necessary to change the current names of three species, in two cases substituting older names, and in one case supplying a new name. The first requirement for a proper disposition of the many published names was the positive identification of Michaux's *J. polycephalus*, published in 1803, which, at different times, has been attached by various authors to nearly a dozen different plants, and has therefore fallen into disrepute and consequent disuse. With our present knowledge of the group, however, the name is capable of positive identification. The current disposition of *J. polycephalus* has been to treat it as a synonym of *J. scirpoides* Lam., a species published in 1789; but upon examination of Michaux's work it is found that he described two varieties of *J. polycephalus*, variety *crassifolius* and variety *tenuifolius*, respectively, giving to the former the diagnosis: "Major, foliis multo crassioribus et conspicue compressis." It is clear that this variety, which is the type form of *J. polycephalus*, is one of the two plants known at the present time as *J. Engelmanni* Buch. and *J. crassifolius* Buch. Since the latter species, however, is a plant of the Arkansas-Texas region there can be no doubt that Michaux's *J. polycephalus*, accredited to Georgia and the Carolinas, is the species now known as *J. Engelmanni*, which is abundant in these States, and it is necessary, therefore, to so treat it. Michaux's second variety, *tenuifolius*, was diagnosed simply as "foliis subfiliformibus." Dr. Buchenau, examining a flower from Michaux's specimen[1] of this variety, has pronounced it true *Juncus scirpoides*.

Key to the Species.

Capsule with a true beak, the valves in dehiscence united above by the beak, their margins usually involute.
  Uppermost cauline leaf with an almost obsolete blade rarely exceeding 1 or 2 cm. in length. 1. *J. megacephalus.*
  Uppermost cauline leaf with a normal blade, few to several cm. in length.
    Stamens as long as the inner perianth parts, the anthers exserted between them; leaf-blades slender and terete. 2. *J. scirpoides.*
    Stamens considerably shorter than the inner perianth parts, their anthers included; leaf-blades usually stout and laterally compressed or even gladiate. 3. *J. polycephalus.*
Capsule without a true beak, the valves in dehiscence flat and separating throughout, their apices spreading or rarely loosely attached. 4. *J. validus.*

1. JUNCUS MEGACEPHALUS M. A. Curtis.*

Juncus megacephalus M. A. Curtis, Bost. Journ. Nat. Hist. 1: 132. 1835.

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[1] Buchenau, Monog. Junc. 325. 1890.

* After examining a large number of herbarium specimens and observing both plants in the field for several years, I am convinced that Torrey's *Juncus nodosus megacephalus* does not intergrade with *J. nodosus* proper. In view of the earlier *Juncus megacephalus* of Curtis, Torrey's plant is named as follows:

JUNCUS TORREYI nom. nov.
Juncus nodosus var. *megacephalus* Torr. Fl. N. Y. 2: 326. 1843.
Juncus megacephalus Wood, Classbook Bot. Ed. 2: 724. 1861. Not Curtis.

Juncus scirpoides var. *echinatus* Engelm. Trans. St. Louis Acad. **2**: 468. 1868.

Juncus scirpoides Carolinianus Coville, Mem. Torr. Bot. Club, **5**: 107. 1894.

Plant 30 to 100 cm. high; blade of the uppermost cauline leaf only in very vigorous specimens exceeding 1 or 2 cm. in length; fruiting heads 8 to 12 mm. in diameter; perianth reddish brown above; stamens one-half to two-thirds the length of the perianth, the anthers included; capsule equaling the perianth, its valves united above in dehiscence.

Specimens have been examined only from the southern coast region from North Carolina to Florida, although the plant was accredited by Dr. Engelmann with a range as far north as Maryland.

2. JUNCUS SCIRPOIDES Lam.

Juncus scirpoides Lam. Encycl. **3**: 267. 1789.

Juncus polycephalus tenuifolius Michx. Fl. Bor. Amer. **1**: 193. 1803.

Juncus echinatus Muhl. Descr. Uber. Gram. 207. 1817.[1]

Juncus echinatus "Muhl.;" Ell. Bot. S. C. & Georg. **1**: 410. 1817.[2]

Juncus macrostemon J. Gay; Laharpe Monog. Junc. 140. 1825.

Juncus scirpoides var. *macrostemon* Engelm. Trans. St. Louis Acad. **2**: 467. 1868. Includes the forms *macrostylus* and *brachystylus*.

Juncus scirpoides genuinus Buch. Monog. Junc. 323. 1890.

Plant 20–70 cm. high; leaf-blades terete, 2 mm. or less in thickness, with perfect septa; fruiting heads 8–11 mm. in diameter; perianth 2.5–3.5 mm. long, green throughout; stamens equaling the inner perianth parts, the short anthers exserted; capsule exceeding the perianth, its valves united above in dehiscence.

A species of the coastal plain from New Jersey and eastern Pennsylvania southward through the Atlantic States to Florida and westward to Texas.

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[1] Buchenau (Monog. Junc. 323) has recorded his critical examination of flowers from Muhlenberg's specimen.

[2] There is nothing to indicate that Elliott distinguished *J. megacephalus* from *J. scirpoides*. He undoubtedly included both, if indeed he ever saw the former, under *J. echinatus*.

3. JUNCUS POLYCEPHALUS Michx.

Juncus polycephalus Michx. Fl. Bor. Amer. **1**: 192. 1803.

Juncus polycephalus crassifolius Michx. Fl. Bor. Amer. **1**: 193. 1803.

Juncus nodosus polycephalus Pers. Syn. Pl. **1**: 384. 1805.

Juncus echinatus Muhl. Cat. 36. 1813.*

Juncus scirpoides var. *polycephalus* forma *minor* Engelm. Trans. St, Louis Acad. **2**: 468. 1868.

Juncus Engelmanni Buch. Krit. Verz. Junc. 67. 1880.

Plant robust, about 1 meter high; leaf-blades in most cases gladiate, 3–8 mm. broad and with incomplete septa, sometimes merely compressed, narrower and with complete septa; fruiting heads 8–12 mm. in diameter; stamens one-half to three-fourths as long as the perianth, the anthers included; valves of the capsule united above in dehiscence and usually with conspicuously involute margins; the beak well defined, commonly 2 mm. in length and not splitting at maturity.

From North Carolina to Florida and westward through the Gulf States to Texas. This species, on account of its gladiate leaves, has been placed by Dr. Buchenau in the group with *Juncus xiphioides* and *J. oxymeris*, but its true relationship is unquestionably with *J. scirpoides*, as indicated by its flowers and fruit.

JUNCUS VALIDUS nom. nov.

Juncus scirpoides polycephalus forma *major*. Engelm. Trans. St. Louis Acad. **2**: 468, 1888.

Juncus crassifolius Buch. Monog. Junc. 326. 1890. Not *J. polycephalus crassifolius* Michx. 1803.

Plant 40 to 100 cm. high, stout and stiff; leaf-blades compressed, but never gladiate, 2 to 4 mm. wide, the septa complete; fruiting heads 12 to 15 mm. in diameter; perianth 4 to 5 mm. long; stamens about one-half as long as the perianth, the anthers included; capsule exceeding the perianth, its valves flat, separating throughout in dehiscence or sometimes slightly united above; no well defined solid beak present.

A plant of the southern prairie region, extending from Arkansas to Indian Territory, Oklahoma, and Texas on the west, and to Mississippi on the east.

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*Muhlenberg based his name upon the *J. polycephalus* of Michaux, evidently not distinguishing the two varieties which Michaux included therein.

New Species of Physalis.

By P. A. Rydberg.

In a recent study of the North American species of *Physalis* the following new species have been determined. Since the material is widely scattered in herbaria, I deem it best to publish the descriptions pending the completion of the final monograph.

✓ PHYSALIS SUBULATA n. sp.

Fruiting calyx sharply 5-angled, more or less acuminate, calyx-lobes (at flowering time) lanceolate or acuminate, as long as the tube or longer; plant more or less villous or viscid-pubescent, erect, dichotomously branched, 2–4 decimetres high, stem angular and striate; leaves round-ovate, somewhat oblique at the base, generally coarsely dentate; pedicels shorter than the small corolla, which is 2–3 millimetres in diameter; calyx-lobes shorter than the corolla; fruiting calyx sharply angled and purple-veined, heart-shaped in section.

This is intermediate between *P. Barbadensis* and the South Mexican *P. nicandrioides* Schlecht. From the former it differs in the more glandular pubescence, and the long acumination of the calyx-lobes; from the latter in its smaller rounder leaves, in its calyx-lobes, which are shorter than the corolla, and in the fruiting calyx, which is smaller and not of a firm texture.*

P. subulata has not yet been within the United States, but comes near to its border.

Mexico. State of Chihuahua: C. G. Pringle, No. 1344, 1887 (type). It is in the following herbaria: Columbia College, University of Minnesota and Professor Greene.

✓PHYSALIS COMATA n. sp.

Perennial, erect, about 0.5 metre high; pubescence fine and short, that on the calyx, pedicels and upper branches mixed with long white flat jointed hairs; like *P. heterophylla* Nees (*P. Virginiana* Gray, not L.), but leaves smaller, blade not over 0.5 decimetre long, rounded, ovate, scarcely at all cordate at the base, about 5 centimetres long, thin, somewhat repand-dentate or nearly entire; petioles as long as the leaves; corolla greenish-yellow with brown centre; fruiting calyx as in *P. hederaefolia* Gray, but of thinner texture.

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* Another related Mexican species is *P. hirsuta* Mart. & Gal., not Dunal. It differs from *P. subulata* in its larger, less veiny fruiting calyx, from *P. nicandrioides* by the calyx, which is not of a firm texture, and from both by its subentire leaves. It most resembles *P. pubescens*, but differs in its subulate calyx-tips.

The validity of this as a species may be doubted. It is intermediate between *P. heterophylla* and *P. hederaefolia* and might be placed as a variety of either with about equal right. It, perhaps, most resembles the latter, but differs in the thinner texture of the leaves and the fruiting calyx, in the larger flower and in the long white hairs.

The following localities are recorded:

Nebraska: P. A. Rydberg, No. 269, 1891 (type).

Kansas: E. Bartholomew, No. 2, 1892; E. A. Popenoe, 1875.

Texes: G. Jermy, No. 618, 1890.

✓PHYSALIS VERSICOLOR n. sp.

Finely pubescent, in age glabrate; stem from a stout perennial root, much branched, at first erect but later spreading, slender, obtusely angled; lower leaves reniform-cordate, the upper ovate, all more or less oblique at the base, sinuately toothed, 2–4 centimetres long, on slender petioles which are generally a little longer than the blade; pedicels slender, about the length of the petioles; calyx-lobes taiangular-ovate, shorter than the tube; flowers about 1 centimetre wide, yellow or drab with brown spots in the centre, turning bluish in drying; fruiting calyx thin, ovoid-cylindrical, reticulate, decidedly 10-angled, 2.5–3.5 centimetres long, generally open at the mouth.

The specimens collected within the United States are more erect, have larger leaves and fruiting calyces than the Mexican. Rare within the United States.

New Mexico: C. Wright, 1851 (Mo. Bot. Gard. herb.).

Arizona: Treadwell, 1879 (Cal. Acad. Sci.).

Mexico, Guaymas: Ed. Palmer, 621 and 622. 1887.

✓PHYSALIS VERSICOLOR MICROPHYLLA n. var.

Like the species, but leaves only about 1 centimetre long, deltoid, coarsely toothed, peduncles about twice the length of the leaves; fruiting calyx nearly spherical, 1.5 centimetres long, tinged with purple.

Mexico, Guaymas: Ed. Palmer, No. 94, 1887 (herbaria of J. Donnell Smith, of Columbia College, Professor Greene, etc).

✓ Physalis macrophysa n. sp.

Perennial; root somewhat thick and fleshy; stem erect, 0.5–1 metre high, comparatively slender, angled, perfectly smooth, or the upper parts sparingly pubescent with very short hairs; leaves large, thin, 4–8 centimetres long, 2–5 centimetres wide, the lower obtuse, the upper acute or acuminate, on slender petioles 2–4 centimetres long; pedicels 1–1.5 centimetres long, erect, in fruit reflexed; calyx smooth, lobes ovate-triangular or broadly lanceolate, generally a little shorter than the tube; corolla yellow with a dark centre, about 2 centimetres in diameter; anthers generally yellow, sometimes tinged with purple; fruiting calyx large, 3–4 centimetres long, 2.5–3 centimetres in diameter, pyramidal to ovoid-conical, indistinctly 10-angled, deeply sunken at the base; berry small, in the centre of the calyx.

This is nearly related to *P. longifolia* and *P. Philadelphica*, but differs from both by its very large and inflated fruiting calyx and its broader leaves. The following specimens have been examined:

Arkansas: A. E. Heacox, 1889.
Kansas: E. A. Popenoe, No. 68, 1875.
Texas: Lindheimer, 1828; A. A. Heller, No. 1756. 1894.
North Carolina (?): Small and Heller, No. 389. 1891.*
Ohio (?): T. H. Horseford,* 1879; C. W. Short,* garden (?).

University of Nebraska.

The Nomenclature Question.

By Lester F. Ward.

The German who was asked why he called his boy Hans replied:

"Pecaus it vas hees name."

The story is an old one, but no one has ever questioned the conclusiveness of the reply. It is the same answer that must be made to the question why a botanical name should be changed to make it conform to the law of priority. When a child is christened the name he receives is the one that he is supposed to have during life. A man with several aliases is always an object of suspicion. Is there any reason why the first name that is given to a plant or animal should not always be its name as well as in the case of a human being? It is true that there is this difference, that the poor plant or animal has no choice at any time, while the child after it becomes a man or woman might have something to say if an outsider should attempt to impose a different name. Still it does not seem that the principle is fundamentally changed by this circumstance. If a lost child were to be found and named and brought up by the finder, and he should afterwards learn who his parents were and what his name was, he would very likely insist on being called by that first name. I remember that one of my boyhood playmates was called 'Ed. Wheelock,' but even when I knew him he was aware that Wheelock was not his name, but that of the person who had adopted him, and afterward, having lost him for many years from view, on meeting him again, it was Mr. Edgar Currier with whom I had to do.

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* These specimens lack fruit and may belong to the preceding, but the leaves most resemble those of *P. macrophysa.*

Now it seems to me that all we are trying to do is to find out what the name of a plant is. It has happened in so many cases that plants have strayed, as it were, from home, been lost, adopted by strange persons, and given different names, lost for a time again and again found and renamed, and so on, that for us who now know them it is an exceedingly difficult matter to trace their history back and find out who they are. All this is due to the well known vicissitudes of all modern branches of natural history, especially of botany. In this general search for the true parentage and the true names of plants there should certainly be no difference of opinion on the main question and all should admit that what is wanted is to ascertain the real name, for all synonyms are simply aliases, and the only real name is the first name.

Nothing can certainly be more confusing than the existence of a large number of different names for the same thing, and it is no wonder that a movement was set on foot near the beginning of the present century, to endeavor to trace up the true history and find the true names of plants. It is a significant fact that this movement was initiated by a botanist, the great Augustin Pyrame de Candolle, in 1813, in his "Théorie élémentaire de la botanique," from which I translate the following paragraphs :

Page 228 : "In order that a nomenclature become universal it must be fixed, and the fixity of that of natural history is founded on this . . . principle . . . that the first one who discovers an object, or who records it in the catalogue of science, has the right to give it a name, and that this name must be necessarily accepted, unless it already belongs to another object or transgresses the essential rules of nomenclature."

Page 241: "It may be said in general that any name which does not involve a contradiction with the plant, and especially which does not belong to any other species, is sufficiently good to be preserved. The impropriety of a specific name or the possibility of finding more suitable ones is not sufficient to authorize a change."

Page 250, conclusion: "All this scaffolding of botanical nomenclature would crumble at its base and inevitably fall if the great majority of naturalists did not recognize the principle of which I have spoken, viz., the necessity of accepting the name given by the discoverer of a plant whenever that name is conformable to the rules. A name cannot be changed because it has little meaning; for on the same principle the second could be suppressed if a third better one was found, and the third if a fourth should present itself, etc.; thenceforward there would be no longer any fixity in nomenclature, or rather, there would be no longer any scientific nomenclature. The author himself who has first established a name has no more right than any one else to change it for the simple cause of impropriety. Priority, on the contrary, is a fixed, positive limitation, which admits of nothing arbitrary or partial; the most ancient name must therefore be always admitted."

De Candolle, it is true, made five exceptions to this universal rule, some of which would not now be regarded as valid, such, for example, as his exception according to which the name *Lunaria annua** might be changed because the plant is not an annual; but it has not been pretended that de Candolle fully grasped the importance of the movement, but only that the movement is itself in the nature of an evolution to which de Candolle, even that early, gave the initial impetus.

The English mind did not become fully aroused to the subject until nearly thirty years later, but the movement in that country was much broader and embraced not merely botany but all branches of natural history.

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* This name is accepted in the "Kew Index." [ED.]

Such was the "Stricklandian code," adopted in 1842 and otherwise known as the "Rules of the British Association." Among the great names connected with this Stricklandian code are those of Mr. Charles Darwin and Professor Henslow. In 1860 this code was reënacted with only a few changes, all looking to greater success in attaining the same object. Mr. Darwin still served on the committee, likewise Mr. A. R. Wallace, Mr. P. L. Clayton, Professor Balfour, Professor Huxley, and among botanists proper Dr. J. D. Hooker and Mr. George Bentham. A still further revision of the same was made in 1865, and this code now stands, but, strangely, has been supposed to be applicable only to zoölogy, although its provisions were equally applicable to the vegetable kingdom. In the preface of this code occurs this sentence:

"No one person can subsequently claim an authority equal to that possessed by the person who is the first to define a new genus or describe a new species."

In 1867 Alphonse De Candolle presented to the International Botanical Congress, held at Paris, a system of laws of nomenclature, upon which he had been long engaged and which with very few changes was adopted by that Congress. No one certainly could have felt more forcibly the evil effect of the multiplication of plant names than the author of the Prodromus, and in the introduction to these rules he says "in the four volumes of the Prodromus published from 1824 to 1830 the proportion of admitted genera to synonyms was approximately 100 to 55; that is to say, there were at that time about half as many synonyms as admitted genera. In the Genera Plantarum of Bentham and Hooker, fascicles 1 and 2, published from 1862 to 1865, which comprise about the same series of families, I have found in making the same approximate calculation 117 synonyms for 100 admitted genera. Therefore, the proportion of generic synonyms must have doubled in 36 years." This Candollean code was based, like the Stricklandian, on the law of priority and Article 15 of that code is as follows:

"Each natural group of plants can bear in the science only one valid designation, namely, the most ancient one adopted by Linnaeus, or given after him on condition that it be conformable to the essential rules of nomenclature."

It was a noticeable fact that the Botanical Congress of Paris, which adopted these rules, was not attended by the English botanists, and Mr. W. B. Hemsley in an article in "Nature" for December 24, 1891, says of this Congress:

"In 1867 a Botanical Congress was held in Paris, to which botanists of all countries had been invited, and the most important subject discussed was botanical nomenclature. Mr. A. de Candolle had drawn up a most carefully considered code of rules to govern botanists in their writings; and this code was submitted to the assemblage of botanists, each rule being formulated and modified as the majority deemed wise. Finally the whole was printed and circulated. The fundamental principle of these laws was priority of publication with *adequate* descriptions, and unfortunately it was made retrospective without any sufficiently defined statute of limitations. For reasons of their own the Kew botanists took no part in the proceedings of this Congress; whether wisely or not it would be difficult to determine and fruitless to discuss."

It would be fruitless for me to discuss the reasons which have led the botanists of Kew to manifest so little sympathy with the general movement in favor of reform in nomenclature. Most of these reasons are well known to readers, but, as has already been said, this indifference was not due to any lack of appreciation of the importance of this reform, or of general sympathy with it, on the part of the two great leading systematists of England, Dr. Hooker and Mr. Bentham, who, as we have seen, both signed the Stricklandian code. In fact, no systematist has ever squarely approached the question and given it due attention without arriving at substantially the same conclusion. Dr. Asa Gray in his Structural Botany, page 348, says: "For each plant or group there can be only one valid name and that always the most ancient if it is tenable, consequently no new name should be given to an old plant or group except for necessity. That a name may be bettered is no valid reason for changing it." And on this principle it is worthy of note that against his convictions he maintained our common blue violet under the name *Viola palmata* L., var. *cucullata* Gray, because he admitted the necessity of taking up an older name if the plant should be given specific rank, saying:

"*Viola cucullata* Ait. ought to have been referred, as an entire-leaved variety, to the Linnaean *Viola palmata*. I am the more constrained to do so now by the fact that the name *cucullata* would have to give way to the much earlier published *V. obliqua* Hill, well figured and unmistakable in his Hortus Kewensis."*

Dr. David Starr Jordan, President of Leland Stanford University and a well-known ichthyologist has said, "There are only two ways of naming plants or animals, either to give them their oldest names or to give them any names you please."† Notwithstanding the general agreement among zoölogists to the principle of the Stricklandian code it was found difficult to enforce these principles unanimously, and in 1876 the question came up afresh at the Buffalo meeting of the American Association for the Advancement of Science, and a new and slightly modified code which had been drawn by Professor Dall was adopted one year later.‡ It deals largely with the multitudinous details of zoölogical science and makes no concessions, but holds the general law of priority as the basis of all sound nomenclature, which is there reënacted and amplified. This code is now, I believe, almost unanimously enforced by zoölogists within the United States.

It does not, however, seem to have covered the case of ornithology, and the ornithologists were still in the worst possible condition in relation to the multiplication of names. At last, losing, as it would seem, all patience with the system in vogue, they met, and by a unanimous action of the American Ornithologists' Union the most stringent code of nomenclature was adopted that has ever been proposed. This is known as the code of nomenclature of the American Ornithologists' Union, published in 1886. The ornithologists had the advantage of perfect unanimity, which is one of the most important conditions to making any code a complete success. The condition of affairs that prevailed before this

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*Asa Gray, Botanical Gazette, **11**: 254. 1886.

†Botanical Gazette, **20**: 163. 1895.

‡Proc. A. A. A. S., **26**: 1877. Appendix.

list (1886) is well shown by comparing the lists that preceded it, that is, the lists of North American birds published by Baird in 1859, Coues in 1874, Ridgway in 1881 and Coues in 1882. By taking the first fifty genera given in the American Ornithologists' Union check-list it is found that in only *five cases* has the generic name remained the same from 1859 to 1886. That is, 45 of the 50 generic names (90 per cent.) have been unstable. Since the American Ornithologists' Union list *not one* of these fifty names has changed. The accompanying tabular statement will show more clearly than words the changes in these fifty genera. This complete list embraces 322 genera and about one thousand species and sub-species. In the ten years that have elapsed since its publication it has been found necessary to change only three genera, one sub-genus, three species and one sub-species by action of the law of priority. (See opposite table.)

This truly astonishing result must certainly be highly gratifying to the ornithologists, and the question arises whether botanists can bring about any such result in their department. A feeling in favor of such a movement has been growing stronger and stronger for a number of years, and has at last taken shape in the appointment of a committee of the Botanical Club of the American Association for the Advancement of Science at Rochester, in 1892, who proposed a set of rules of botanical nomenclature with which all are now familiar. The Club also authorized the publication, as an earnest of what the enforcement of these rules might be expected to accomplish, of a list of the plants of northeastern North America. This list is also too familiar to require comment. Of it Professor Bessey has said: "This book is the sign that the day of 'authority' as such, is ended, and the day of 'law' has begun.* All that it seems necessary to say is that there seems to be a misapprehension on the part of some botanists as to the method by which this list was prepared, it being imagined by a few persons that the particular individuals who had most to do with it were in some way personally responsible for the result. It should be known to all that they were merely the instruments in the hands of a large committee, and that every question was submitted to all the members of that committee, even when not in

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* American Naturalist, 29: 350. 1895.

BAIRD. 1859.	COUES 1874.	RIDGWAY. 1881.	COUES. 1882.	A. O. U. CHECK-LIST. 1886.
Podiceps.	Podiceps.	Aechmophorus.	Aechmophorus.	Aechmophorus.
Podiceps.	Podiceps.	Podiceps.	Podiceps.	Colymbus.
Podilymbus.	Podilymbus.	Podilymbus.	Podilymbus.	Podilymbus.
Colymbus.	Colymbus.	Colymbus.	Colymbus.	Urinator.
Mormon.	Fratercula.	Lunda.	Fratercula.	Lunda.
Mormon.	Fratercula.	Fratercula.	Fratercula.	Fratercula.
Cerorhina.	Ceratorhina.	Ceratorhina.	Ceratorhina.	Cerorhinca.
Ptychorhamphus.	Ptychorhamphus.	Ptycorhamphus.	Ptychorhamphus.	Ptychorhamphus.
Ombria.	Phaleris.	Phaleris.	Simorhynchus.	Cyclorrhynchus.
Phaleris.	Simorhynchus.	Simorhynchus.	Simorhynchus.	Simorhynchus.
Brachyramphus.	Synthliborhamphus.	Synthliborhamphus.	Synthliborhamphus.	Synthliboramphus.
Brachyramphus.	Brachyrhamphus.	Brachyrhamphus.	Brachyrhamphus.	Brachyrhamphus.
Uria.	Uria.	Uria.	Uria.	Cepphus.
Uria.	Lomvia.	Lomvia.	Lomvia.	Uria.
Alca.	Utamania.	Utamania.	Utamania.	Alca.
Alca.	Alca.	Alca.	Alca.	Plautus.
Mergulus.	Mergulus.	Alle.	Alle.	Alle.
Stercorarius.	Stercorarius.	Megalestris.	Stercorarius.	Megalestris.
Stercorarius.	Stercorarius.	Stercorarius.	Stercorarius.	Stercorarius.
Pagophila.	Larus.	Pagophila.	Pagoph la.	Gavia.
Rissa.	Larus.	Rissa.	Rissa.	Rissa.
Blasipus.	Blasipus.	Larus.	Larus.	Larus.
Rhodostethia.	Rhodostethia.	Rhodostethia.	Rhodostethia.	Rhodostethia.
Xema.	Xema.	Xema.	Xema.	Xema.
Sterna.	Sterna.	Sterna.	Sterna.	Gelochelidon.
Sterna.	Sterna.	Sterna.	Sterna.	Sterna.
Hydrochelidon.	Hydrochelidon.	Hydrochelidon.	Hydrochelidon.	Hydrochelidon.
Sterna.	Anous.	Anous.	Anous.	Anous.
Rhynchops.	Rhynchops.	Rhynchops.	Rhynchops.	Rhynchops.
Diomedea.	Diomedea.	Diomedea.	Diomedea.	Diomedea
Diomedea.		Diomedea.		Thalassogeron.
Diomedea.	Diomedea.	Diomedea.	Phoebetria.	Phoebetria.
Procellaria.	Fulmarus.	Ossifraga.	Ossifraga.	Ossifraga.
Procellaria.	Fulmarus.	Priocilla.	Priocilla.	Fulmarus.
Puffinus	Puffinus.	Priofinus.	Priofinus.	Puffinus.
Procellaria.	Aestrelata.	Oestrelata.	Oestrelata.	Aestrelata.
		Oestrelata.	Oestrelata.	Bulweria.
Daption.	Daption.	Daption.	Daption.	Daption.
	Halocyptena.	Halocyptena.	Halocyptena.	Halocyptena.
Thalassidroma.	Procellaria.	Procellaria.	Procellaria.	Procellaria.
Thalassidroma.	Oceanodroma.	Oceanodroma.	Oceanodroma.	Oceanodroma.
Thalassidroma.	Oceanites.	Oceanites.	Oceanites.	Oceanites.
Fregetta.	Fregetta.	Fregetta.	Fregetta.	Cymodroma.
Phaëton.	Phaëthon.	Phaëthon.	Phaëthon.	Phaëthon.
Sula.	Sula.	Sula.	Sula.	Sula.
Plotus.	Plotus.	Plotus.	Plotus.	Anhinga.
Graculus.	Graculus.	Phalacrocorax.	Phalacrocorax.	Phalacrocorax.

session, by sending out circulars, and that the deliberate vote of each member was taken in each case and the questions settled, where not unanimous, by a majority vote. For my own part I confess that I voted with the minority on a number of minor questions, but always with the feeling which I observed to prevail, not only among the members of the committee, but apparently throughout the Botanical Club itself, that minor questions were to be ignored in the presence of the great necessity for the adoption of rules to which all would subscribe. This list, prepared under many disadvantages, is, of course, imperfect in many respects and contains a few features which are especially irritating to those who attempt to use it. I have never known a botanist who was not irritated at the changing of names, yet we have all been obliged during the entire course of our studies to submit to wholesale changes of names at periodical intervals. This is no new thing, as any one may learn by reading the preface to the sixth edition of Prof. Amos Eaton's Manual of Botany, published in 1833. He says:

"It may be asked, why I do not follow De Candolle, *servilely*, since so many distinguished botanists have borne testimony to his great merit? Perhaps no one is a more devoted admirer of his discriminating talents, great learning and untiring assiduity than myself. But he imposes on his readers the labor of learning a multitude of new names without even a shadow of pretence. * * * * As far as I have any influence I pledge it here that the embarrassing innovations of De Candolle and others are of no *possible use* to the science of Botany. All new discoveries, however (which are not a few), *should be adopted;* and they *are adopted* in this edition. And the *necessary* new names and new nomenclature are also adopted and fully explained." (Italicized as in the original).

No one can doubt Professor Eaton's high motive in giving utterance to what he considered so conservative an expression of his views regarding the changes in classification and nomenclature made by De Candolle, and doubtless he considered De Candolle's researches as ill-advised and ephemeral as do some of our estimable contemporaries the Association code of to-day, yet I am constrained to look upon their protests as belonging to no different category than Professor Eaton's.

The botanical world has submitted to frequent changes like those we have known in the past fifty years with very little remonstrance compared to the great annoyance which they produce. In this work a new set of changes is thrust upon us, some of them very great and calculated to appeal strongly to our sense of veneration for the older names which we have so long known, and it is not to be wondered at that those who do not understand that there is any difference between this movement and the long series of changes that have been introduced in times gone by, in the different editions of our manuals and the new botanical works that have appeared, should strongly resent this last proposition to compel us to memorize a new set of names. In America the principal reasons for submitting as tranquilly as botanists have done to the changes that have been imposed has chiefly been the great respect in which all American botanists have held the authors of these books. In the case of Dr. Asa Gray that respect amounted in a very large number of cases to something more—to a real sentiment of personal affection; but this condition of things no longer exists. The argument at best was an unsound one, but one which was nevertheless effective. At the present time botanists must be convinced that any wholesale changes that are to be introduced in the botanical nomenclature of America are made for good reasons.

But, on the other hand, there is now far greater necessity for the adoption of some fundamental rules of nomenclature than have heretofore existed. Formerly there was one high seat from which the botanical decrees emanated, and there was far less danger that unreasonable things would be done by one or two persous than by many. At the present time there are large numbers of botanical centres, and if matters are to be left to the individual judgment of publishing botanists, there will be no comparing the confusion that is in store for us with that which we have had in the past. Heretofore we have only had the differences which one man or one class of men in close coöperation thought best to introduce at different periods in their own work. Now we shall not only have the changes that each individual is likely to make at different dates, but as many differences as there are different sources from which our works are to emanate. It is difficult

GRAY, MANUAL, ED. 1.	GRAY, MANUAL, ED. 2.	GRAY, MANUAL, ED. 4.	GRAY, MANUAL, ED. 5.	GRAY, SYNOPT. FL. N. AM.	GRAY, MANUAL, ED. 6.
Lappa major Gaertn.	Lappa Major Gaertn.	Lappa major Gaertn.	Lappa officinalis All.	Arctium Lappa L.	Arctium Lappa L.
Nabalus Fraseri DC.	Nabalus Fraseri DC.	Nabalus Fraseri DC.	Nabalus Fraseri DC.	Prenanthes serpentaria Pursh.	Prenanthes serpentaria Pursh.
Diplopappus amygdalinus T. & G.	Diplopappus amygdalinus T. & G.	Diplopappus amygdalinus T. & G.	Diplopappus amygdalinus T & G.	Aster umbellatus Mill. var. latifolius G.	Aster umbellatus Mill. var. latifolius G.
Solidago serotina Ait.	Solidago serotina Ait.	Solidago serotina Ait.	Solidago serotina Ait.	Solidago serotina Ait. var. gigantea G.	Solidago serotina Ait. var. gigantea G.
" gigantea Ait.	" gigantea Ait.	" gigantea Ait.	" gigantea Ait.	Solidago serotina Ait.	Solidago serotina Ait.
Smilacina bifolia Ker.	Smilacina bifolia Ker. var. Canadensis G.	Smilacina bifolia Ker. var. Canadensis G.	Smilacina bifolia Ker. var. Canadensis G.		Maianthenum Canadense Desf.

GRAY, MANUAL, ED. 1.	GRAY, MANUAL, ED. 2.	GRAY, MANUAL, ED. 4.	GRAY, MANUAL, ED. 5.	WATSON, BIBLIOG. INDEX.	GRAY, MANUAL, ED. 6.
Pulsatilla patens Mill.	Pulsatilla Nuttalliana Gray.	Pulsatilla Nuttalliana Gray.	Anemone patens L. var. Nuttalliana Gr.	Anemone patens L. var. Nuttalliana Gr.	Anemone patens L. var. Nuttalliana Gr.
Ranunculus Purshii Rich.	Ranunculus Purshii Rich.	Ranunculus Purshii Rich.	Ranunculus multifidus Pursh. var. terrestris Gray.	Ranunculus multifidus Pursh.	Ranunculus multifidus Pursh. var. terrestris Gray.
Ranunculus aquatilis L.	Ranunculus aquatilis L. var. divaricatus Gr.	Ranunculus aquatilis L. var. divaricatus Gr.	Ranunculus divaricatus Schrank.	Ranunculus aquatilis L var. stagnatilis D.C.	Ranunculus circinatus Sibth.
Viola Muhlenbergii Torr.	Viola Muhlenbergii Torr.	Viola Muhlenbergii Torr.	Viola canina L. var. sylvestris Regel.	Viola canina L. var. sylvestris Regel.	Viola canina L. var. Muhlenbergii Gray.
Elodea Virginica Nut.	Elodea Virginica Nut.	Elodea Virginica Nut.	Elodes Virginica Nut.	Elodes Virginica Nut.	Elodes campanulata Pursh.
Lechea thymifolia Pursh.	Lechea thymifolia Pursh.	Lechea thymifolia Pursh.	Lechea thymifolia Pursh.	Lechea thymifolia Pursh.	Lechea minor Lam. var. maritima Gray.
Spergularia rubra Pers. var. marina Gray.	Spergularia rubra Pers. var. marina Gray.	Spergularia rubra Pers. var. marina Gray.	Spergularia media Presl. var. macrocarpa Gr.	Lepigonum medium Fries. var. macrocarpa Wats.	Buda marina Dumort.
Nuphar lutea Smith. var. Kalmiana Gr.	Nuphar Kalmiana Pursh.	Nuphar Kalmiana Pursh.	Nuphar luteum Smith. var. pumilum Gray.	Nuphar pumilum Smith.	Nuphar Kalmianum Ait.

under such circumstances to imagine what the condition of things would be were this to go on for several generations. If this ist was as complete and general as that of the Ornithologists' Union adopted in 1886, there is no reason to suppose that the result in botany may not be practically the same as it has proved to be in ornithology, and that with the publication of this one last set of changes, which would be simply a serious attempt to actually find what the true names of our plants are, the long continued process of bandying these plants about from one name to another must cease and each plant would have at last found its true and permanent resting place.

To illustrate in botany as has been done in ornithology we may take several of the editions of Gray's Manual, Sereno Watson's Bibliographical Index and Gray's Synoptical Flora, and make a few comparisons to show the fluctuations that species of American plants have undergone. (See opposite table.)

These are only a few samples taken almost at random of the extensive changes that were made at the different dates given. To mention my own personal experience, I began with the fourth edition of Gray's Manual only a short time before the appearance of the fifth, yet long enough for me to have wasted many precious hours in memorizing names destined to be changed. And then came the Bibliographical Index for the Polypetalae, introducing large numbers of other changes, followed by the Synoptical Flora, carrying the work into the Gamopetalae. The sixth edition of Gray's Manual edited by Mr. Watson often differs from any of the preceding, showing that the general work of wholesale alteration was still going on. Many botanists supposed, as I did at first myself, that all this was necessary and often the authors stated that the reasons for their changes were because the names formerly published were not the original names, thus directly appealing to the law of priority and defending themselves under this law, but a general glance at the whole affair shows there never was really any systematic attempt to base these changes upon any permanent and consistent scientific principles, but that to a large extent it was left to the individual judgment of the author at the particular time at which he was writing. The utter chaos into which this system has thrown the science of botany is the real cause of a movement for a stable nomenclature.

But it would seem that notwithstanding the general spirit of harmony that prevailed in the Botanical Club, and especially in the large committee that it appointed, the work that has thus far been done does not receive the unanimous approval of the working botanists of the country. A circular has recently been sent out bearing the signatures of a considerable number of men whom the science of botany justly honors, which is, in fact, in the nature of a protest against the movement. In urging the "postponement of any radical measures of reform" these gentlemen seem to admit the possibility of reform and perhaps the need of it, but, after a careful reading of this paper, I am obliged to conclude that it is in the main the result of the temporary irritation, already mentioned, which any new attempt to change the names of our plants is certain to produce. Of course, there are other causes arising out of the respective claims of rival universities, etc., etc. Especially is the *argumentum ad verecundiam* very prominent, and I might almost say justly so, since I yield to none in the profound respect which is generally shared for the great and good Dr. Gray, and for the unrivalled work in systematic botany that has been done at Harvard University. But still I am disposed not to permit mere sentiment to stand in the way of the settlement of so momentous a question as the one now before the botanical world, and I must say frankly, with all due respect for the eminent names that are appended to this circular, that I do not regard their general argument as a sound one, and I look upon the circular as little more than an appeal to botanists to preserve the *status quo*. In other words, it seems to be the product of that natural conservatism which always goes hand in hand with the spirit of progress and has its true function of preventing rash actions and hasty revolutions. With this spirit of order I fully sympathize, but at the same time I believe that the time has come for the completion of the reform movement which has merely been arrested, although gradually gaining ground since the date of the Stricklandian and of the Candollean codes. I do not regard the present movement in any sense revolutionary. It is merely an attempt on the part of botanists to secure a uniform system which has not thus far been actually put in practice, except to a limited extent. It is now proposed to practice what has been preached.

Before attempting to discuss any of the so-called principles laid down in this circular, it may be premised that the advance movement should be regarded as essentially one of disinterested principles which only has to oppose what is really prejudice, but may be called by the milder names of sentiment and conservatism. The botanists who approve of these rules have just as much to lose as those who oppose them, and the difference is that they are willing to make this sacrifice, not for their own sakes, but for the sake of the future of botany. Their work is therefore a labor of love. It is opposed to their personal interest, and they represent the class of botanists who are willing for the sake of the future, in which they will have no part, to make a great personal sacrifice. Very few of the older ones will ever be able to rid themselves of the older names with which they are now familiar. Only the very young workers can hope that this action will redound to their personal advantage. Those who oppose this movement, if there be any (and I have no doubt there are) who really see that it might be the last time that serious changes would have to be made in botanical names, would seem to do so purely from a personal disinclination to incur the annoyance of accustoming themselves to a new set of names. It must be admitted that this motive is not as high as we might hope botanists generally to be actuated by. It is probable that some of the signers of this circular think that no stable nomenclature is possible. It is for the benefit of such that I have introduced the argument showing the action of the Ornithologists' Union, and surely no one can deny that it is equally applicable to botany. In so far as any personal rivalry or rivalry between different institutions is concerned I take no interest in it, and arguments of that nature are not only unworthy of an answer, but really admit of no answer.

As regards the familiarity of names and their sanctity on that account, much more is made of it than it deserves. For example, I have been obliged to familiarize myself with no less than four different sets of botanical names in the course of my own work. The first name I learned for a common plant was felt by me to be sacred, and it seemed a sacrilege to substitute another, but when convinced that it was necessary I submitted, and soon the second name became equally sacred with the first, and so on to the end. Now this is the case with us all in learning the names of our familiar plants. The particular name that we learn for a a plant is all that makes it sacred, and the rising generation of botanists, who will have only before them the actual first name or the real name of the plant, instead of some false synonym that occurs in the present books, will look upon that name with the same veneration as we did upon the false one, and the names that we have learned to cherish will be to them nothing but worthless synonyms. In their case this will be true, whereas in ours we were simply cherishing the names that did not properly belong to the objects to which they were applied.

I have said that the new movement is not only not revolutionary, but is simply in the nature of an evolution which has long been going on. On the contrary, it might be maintained that the so-called principles embodied in this circular, which are alleged to be an expression of conservative views, are really, on the contrary, revolutionary in their character. The following are the principal codes which have been proposed by responsible organizations for the guidance of writers in zoölogy and botany:

De Candolle's Théorie élémentaire de la botanique, 1813.
British Association for the Advancement of Science, 1842.
Association of American Geologists and Naturalists, 1845.
International Botanical Congress, Genoa, 1865.
American Association for the Advancement of Science, 1877.
Société Zoölogique Internationale, 1882.
American Ornithologists' Union, 1883–85.
International Botanical Congress, Genoa, 1892.
Botanical Club, American Association for the Advancement of Science, 1892–93.

The codes adopted by these associations show a steady advance from the idea of giving genera and species names to suit individual taste toward the idea of giving them strictly their oldest names. And the history of nomenclature shows an advance in stability and uniformity corresponding exactly with the thoroughness with which these codes have been carried out. The circular to which reference has been made proposes a new departure in nomenclature, revolutionary in its character and, judging from the history of the science, capable of producing most chaotic results.

It may be said to embody four rules or principles which are opposed to those adopted by the Botanical Club of the American Association. These, which may for convenience be designated the *Harvard rules*, afford a good opportunity for the comparison of the two codes, which every botanist should make for himself deliberately and judicially. It seems eminently desirable that those who have not yet given thought to the subject should understand the full significance of the problem with which the Association botanists have been dealing. The first of them, that relative to ordinal names, it is unnecessary to discuss from the standpoint of the new nomenclature, for no official action on this matter has as yet been taken by the botanical club committee.

The Harvard rules are promulgated after a distinct statement of belief* that no stability in nomenclature is possible, and that the decision as to what names shall be used for genera is to be left to the judgment of individual botanists and not decided by the principle of priority.†

These rules represent the system which for many decades botanists all over the world have been trying to escape, a system which renders the nomenclature of a book thirty or forty years old largely unintelligible, except to the systematist, and which gives every promise of repeating its own history. It is preëminently a *laissez faire* system, and the most that can be claimed for it is that it has served "fairly well." If at the beginning of the present century botanists had adopted a system based on priority, how great would be our obligation to them! Instead of a hundred years of heterogeneous and largely unrecognizable names, we should have had a botanical literature in which a plant would always have had the same name, and ready intelligibility of this literature would be possible to every reader. The botanists of the next century will not, it is hoped, have such a hundred years of constant change to look back upon as we in our time have had.

Some botanists are prone to pin their faith to the arbitrary authority of a standard book, and are holding up that truly magnificent work, the Index Kewensis, now nearly completed, as the safe and only guide in nomenclature. But history shows that the influence of such a work is only temporary at best. Where now is the authority of Steudel's Nomenclator, of Pfeiffer's Nomenclator, and to what extent have they contributed to uniformity in plant names? Both these works have filled an important place in the literature of botany, but for the simple reason that they did not bring forward the oldest name as the valid one they have added little to the stability of our nomenclature. It is greatly to be regretted that at the time when the Index Kewensis was in preparation the demand for a stable nomenclature had not yet become sufficiently strong to lead its authors to add principle to prestige and thus insure its permanency as a nomenclator in addition to its inestimable value as an index.

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* Robinson, Botanical Gazette, 20: 103. Ap. 1895.

† Harvard Rules, No. 2 (May, 1895).

In the prelude to the Harvard rules reference is made to the calling, at an early date, of an International Botanical Congress, presumably for the purpose of "settling" the nomenclature question. It may not be out of place here to urge upon every one who may be a delegate to that Congress, or who may aid in the selection of a delegate, the careful consideration of the fact that no law is stronger than the authority that makes it, and that no authority is stronger in the end than the principle upon which it rests.

A specialist in fungi recently made the admission in conversation, not only that the objections to the new code did not apply in the case of the lower cryptogams, but that the actual application of the code itself would be desirable. The reason given for this was that these orders are not popularly known and hence their nomenclature has not become established by usage. There is the same tacit admission in the language of the Harvard circular:

"These rules [the Harvard rules] are designed to apply only to phaenogams and vascular cryptogams."

In all the lower orders of plants, then, we are to be guided by the law of priority; but as soon as the Pteridophyta are reached, principle is cast aside in favor of sentiment, and because Swartz' name of *Aspidium* happens to be in common use among fern-gatherers, we are enjoined from taking up the perfectly valid designation *Dryopteris* given years previously by Adanson!

Relative to international action it is a matter of gratification to note that recent legislative change has been in conformity with the

American Association principles. The adoption of the first edition of Linnaeus' Species Plantarum, 1753, as the starting point of our system of nomenclature was carried through the Genoa Congress immediately after its adoption at Rochester in 1892. The Austro-German botanists in a meeting held last September adopted another fundamental principle of the American code, the retention of the oldest specific name, under whatever genus published, a principle already put in practice in the later numbers of Engler and Prantl's Natürlichen Pflanzenfamilien.

There are some botanists who hold that the Association rules, although sound, should not be made retroactive. Even in the Harvard rules, three of the four Association rules are expressly admitted to be desirable in future practice. It should be evident to every thoughtful person that if these principles are not made retroactive the desired reform will in no sense be secured. A gardener might with equal wisdom propose to improve a weedy garden simply by preventing the introduction of any more weeds. In the view of the reformers it is necessary to remove the old weeds as well as to keep out the new.

In some respects nomenclatural reform will escape in botany the difficulties that formerly beset it in zoölogy. We have the gratifying assurance that we are not trying an experiment, that the plan is not a merely theoretical one, and that its complete success will unquestionably be attained in botany as it has already been attained in zoölogy. Furthermore, we are able to do in a few years, in one stroke, as it were, what zoölogists, feeling their way over new ground, were many years in accomplishing. All botanists dislike changes in names, and the sooner they can be properly made the better.

There are doubtless some botanists who believe that by general agreement any set of names may be made permanent—that, for example, an International Congress may decide arbitrarily that certain generic or certain specific names are to be considered the proper ones, regardless of any principle. If this were feasible it would be an easy solution of the question, but those who have confidence in such a solution surely cannot have taken into consideration the fact that naturalists and other scientists usually have very little respect for mere authority and very great respect for principle. This sentiment is constantly growing stronger, and there is every reason for believing not only that a large percentage of botanists would refuse to be influenced by an arbitrary agreement of this kind, but that the ever-growing younger element would within a few years absolutely reject it.

One of the statements made under the second head in this circular deserves special consideration. It is as follows: "While the scope of this rule is left to the discretion of writers, it is urged that generic nomenclature should not at present depart far from that of the three important works, Bentham and Hooker's Genera Plantarum, Baillon's Histoire des Plantes, and Engler and Prantl's Natürlichen Pflanzenfamilien, from which for some time to come our most complete and accurate information as to generic limits and affinities is to be derived." Nothing could better illustrate the present chaos of botanical nomenclature than a comparison of these three great works. It would be interesting to make such a comparison throughout their entire extent, but of course space will not permit of this. We may, however, refer to a few cases, taken principally at random, to show how widely these alleged standard authorities differ in the case of generic names.

BENTH. & HOOK.	ENGL. & PRANTL.	BAILLON, HIST.
Stellaria L.	Alsine L.	Stellaria L.
Wistaria Nutt.	Kraunhia Raf.	Wistaria Nutt.
Petalostemon Michx.	Kuhnistera Lam.	Petalostemon Michx.
Centrosema DC.*	Bradburya Raf.	Centrosema DC.*
Shepherdia Nutt.	Lepargyraea Raf.	Shepherdia Nutt.
Spergularia Pers.	Tissa Adans.	Tissa Adans.
Senebiera.	Coronopus Gaertn.	Coronopus Hall.
Nelumbium Juss.	Nelumbo Adans.	Nelumbo Adans.
Cirsium DC.	Cirsium Scop.	Carduus L.
Echinospermum Sw.	Lappula Moench.	Lappula Moench.

Any one who has the patience to carry out such a comparison to a much greater extent will readily see how little effort has been made by the great systematists named to arrive at the original names of genera, and so long as authorities are privileged to adopt the names that best please them, there never will be any end to these wide variations.

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* Bradburya Raf. is included by Benth. & Hook. and Baillon in a list of "genera dubia." The plants in question are placed under Centrosema DC.

It will be seen that all but one of these names cited from Engler and Prantl accord with those accepted by the Botanical Club's committee.

Here again, as in the more general case above mentioned, it seems to me that the present circular is based wholly upon sentiment. The time has gone by when it was regarded as the important consideration to give special credit to the person who becomes the author of a name. It is no longer a question of credit, but a question of practical utility. The namer of a plant has done nothing more than his duty and while his name should of course stand as the author of that name, botanists are not called upon to violate the rules of nomenclature for the sole purpose of doing him some special honor. The argument that the more important service is that of fixing a species under its proper genus, and that therefore the binomial combination should bear the name of the one who established it falls to the ground, and it becomes of far greater importance that the original namer of the species, or even of the variety, if there be such, be accredited with that name, no matter how many vicissitudes it may subsequently undergo. The rule that the namer of the combination may append his name for the author of the combination, although the last term of that combination may have been named long before by another, seems to be very vicious from a number of points of view. In the first place, if the question of justice were worth considering, it would certainly be a gross injustice to the original namer for another botanist to usurp his rights and take credit for his name; but this is not the chief objection. When I see the names *Nuphar kalmiana* Pursh and *Nuphar kalmianum* Ait., I at once assume that the last name refers to a different plant from the first and that the words "non Pursh" or "not of Pursh" are understood; and when I see written *Spergularia media* Presl. var. *macrocarpa* Gray in one book and *Lepigonum medium* Fries var. *macrocarpum* Wats., I am entirely at a loss who the true author for the variety *macrocarpa* is. What seems to be most needed is some clue to the history of these names, and the particular name should always bear the authority of the one who first wrote it.

But I would like to say here that this whole matter of quoting authority is one of the worst evils of botanical writing. Any one who has the least respect for style must be infinitely annoyed by the necessity of tacking on one or two abbreviations at the end of a name in order to give his reader an idea of what he is talking about. It makes an ugly cacophony that should not be tolerated any longer than is absolutely necessary. Now, as I understand it, one of the chief objects of this whole movement is, not to lumber up botanical writing with more things of this kind, but to get rid at the earliest possible moment of the whole of it. The ornithologists in adopting one set of names for all birds, the same name always meaning the same bird, and all agreeing that that shall be the case, have already reached the point at which they can write popular articles about birds and omit the authority, thus lending smoothness and grace as well as clearness to their discussions. This should be one of the great aims of botany. Botanists ought to draw up a list, international in its scope and based on a thorough application of the principle of priority, of all the plants known to the world, and all agree that this list should henceforth and forever be adhered to as the authoritative list of all known plants. This once done and subscribed to by all, it would no longer be necessary in any mention that botanists wish to make of any plant known to science to append the abbreviations of the various persons who have had to do with naming it. This surely would be a consummation devoutly to be wished. Of course, in all subsequent names the authority must be given as heretofore, and supplementary lists could from time to time be prepared to embody the results of current research.

But it may be said, and is said by some as a matter of fact, that advocates of the new rules of nomenclature do not adhere to the law of priority, that it has always been necessary to fix a limit or earliest date back of which it is not permissible to go. It seems superfluous to argue this question because the reasons are so thoroughly well known to all, but it may be said in general that in going back to Linnaeus, the founder of binominal nomenclature, and to the particular work of his which is regarded as containing the most complete expression of his law of binomials, we are practically going back, as in the case of the individual, to the birth or first christening of a genus or species. We may go back in language to the time when there were no common nouns and all nouns were proper names. We are told that some rude languages are still in that condition. Now in ante-Linnaean days there were no true names of plants, certainly not systematic names. All such names may be regarded as trivial or common names, and at the time when Latin was generally written and largely spoken they were scarcely more than vernacular names. Moreover, botanists commenced describing them before they commenced naming them, and the binominal nomenclature is a direct descendant of a system of describing plants. It resulted from the dropping more and more of the adjective terms contained in the character until at last the description consisted of only two names, that of the genus and that of the species. In later times trinominals came more or less into vogue, and as the science advanced it became apparent that the name had little to do with the description, so that although up to this day many or most specific names have a greater or less descriptive value, still large numbers of them possess no such value whatever, and the combination has become simply a name or symbol by which the plant may be known. Elementary as these remarks are, it is upon such facts that is based the reason for fixing some specific standard for the origin of systematic nomenclature, and to all who clearly understand the fact this reason is wholly conclusive.

Since I have commenced the study of fossil plants I have found the same difficulty, and although the science scarcely dates back of the beginning of the present century the nomenclature is in a condition of great confusion. M. R. Zeiller in 1877 encountered this difficulty and expressed himself on the subject in the following clear and trenchant language:*

"The unfortunate confusion that results from these successive changes in the name of one and the same object has taken place the same and in a much greater degree in other older branches of natural history, and to-day the necessity for some remedy is recognized. The only equitable and rational basis that can be adopted is the one that was proposed in 1813 by [A. P.] De Candolle in his Théorie elémentaire de la botanique, in the chapter on Phytography, viz., the maintenance throughout all changes in the genus of the oldest specific name, or, more generally, the absolute principle of the right of priority. In order that the nomenclature may be invariable and universally accepted it must rest upon fixed principles whose application is not subject in any way to arbitrary judgment; thus we should adhere without exception in the case of each genus or species as De Candolle had established it, to the name first in date, even where this name has been recognized as improper and in contradiction with such and such characters of the object or group to which it is applied. Generic or specific names are in fact only designations and not definitions, and if it is admitted that they may be changed because improper, the door is opened to arbitrary action, each author interpreting differently the propriety or impropriety of a name."

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* R. Zeiller, Ingénieur en chef au corps national des mines. Explication de la carte geologique de la France, Tome IV., 2me Partie. Végétaux fossiles du terrain houiller, 1879, p. 5.

I have been engaged for over fourteen years, as time would permit, upon the bibliography and synonymy of fossil plants, and hope ultimately to publish a complete catalogue of all the names that have ever been given to the extinct vegetation of the globe, fully exposing the confusion referred to and adhering strictly in the final revision to the law of priority.

Inasmuch as the representative character of the Botanical Club of the American Association has been called in question, it is of interest to know that some of the opponents of the Rochester movement formerly thought otherwise, as is seen by the following extract from the Proceedings of the Washington Botanical Club of May 7, 1892, which were published in the Botanical Gazette for June, 1892. These resolutions were duly signed by each member of the committee and are preserved in the minutes of the Club.

"At a meeting of the Botanical Club of Washington, held April 23, 1892, a committee was appointed to consider and report upon the questions of botanical congress and nomenclature. At a special meeting called May 7, this committee presented the following report, which was unanimously adopted by the Club:

"Your committee, appointed to consider the questions of a botanical congress and botanical nomenclature, held a meeting on the second of May and prepared the following resolutions:

"*Resolved*, That, while favoring the final settlement of disputed questions by means of an international congress, we do not regard the present as an opportune time, but we recommend the reference of the question of plant nomenclature first to a representative body of American botanists.

"We suggest the consideration, by such body, of the following questions, among others: the law of priority; an initial date for genera; an initial date for species; the principle once a synonym always a synonym; what constitutes publication; the form of tribal and ordinal names; the method of citing authorities; capitalization.

"We recognize the Botanical Club of the A. A. A. S. as a representative body of American botanists and commend to that body for discussion and disposal the subject of nomenclature as set forth in these resolutions."

Respectfully submitted,
LESTER F. WARD,
GEO. VASEY,
F. H. KNOWLTON,
B. T. GALLOWAY,
ERWIN F. SMITH,
GEO. B. SUDWORTH,
FREDERICK V. COVILLE,
Committee.

Missouri Botanical Garden.*

The attention of botanists is called to the facilities afforded for research at the Missouri Botanical Garden. In establishing and endowing the Garden, its founder, Henry Shaw, desired not only to afford the general public pleasure and information concerning decorative plants and their best use, and to provide for beginners the means of obtaining good training in botany and horticulture, but also to provide facilities for advanced research in botany and cognate sciences. For this purpose additions are being made constantly to the number of species cultivated in the grounds and planthouses and to the library and herbarium, and, as rapidly as it can be utilized, it is proposed to secure apparatus for work in vegetable physiology, etc., the policy being to secure a good general equipment in all lines of pure and applied botany, and to make this equipment as complete as possible for any special subject on which original work is undertaken by competent students.

A very large number of species, both native and exotic, and of horticulturists' varieties, are cultivated in the Garden and Arboretum and the adjoining park, and the native flora easily accessible from St. Louis is large and varied. The her-

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[* This article has recently been issued as a leaflet. We take pleasure in placing it more permanently on record and in calling the attention of botanists to the valuable facilities for research afforded.—EDS.]

barium, which includes nearly 250,000 specimens, is fairly representative of the vegetable life of Europe and the United States, and also contains a great many specimens from less accessible regions. It is especially rich in material illustrative of Cuscuta, Quercus, Coniferae, Vitis, Juncus, Agave, Yucca, Sagittaria, Epilobium, Rumex, Rhamnaceae and other groups monographed by the late Dr. Engelmann or by attachés of the Garden. The herbarium is supplemented by a large collection of woods, including veneer transparencies and slides for the microscope. The library, containing about 8,000 volumes and 10,000 pamphlets, includes most of the standard periodicals and proceedings of learned bodies, a good collection of morphological and physiological works, nearly 500 carefully selected botanical volumes published before the period of Linnaeus, an unusually large number of monographs of groups of cryptogams and flowering plants, and the entire manuscript notes and sketches representing the painstaking work of Engelmann.

The great variety of living plants represented in the Garden, and the large herbarium, including the collections of Bernhardi and Engelmann, render the Garden facilities exceptionally good for research in systematic botany, in which direction the library also is especially strong. The living collections and library likewise afford unusual opportunity for morphological, anatomical and physiological studies, while the planthouse facilities for experimental work are steadily increasing. The E. Lewis Sturtevant Prelinnean library, in connection with the opportunity afforded for the cultivation of vegetables and other useful plants, is favorable also for the study of cultivated plants and the modifications they have undergone.

These facilities are freely placed at the disposal of professors of botany and other persons competent to carry on research work of value in botany or horticulture, subject only to such simple restrictions as are necessary to protect the property of the Garden from injury or loss. Persons who wish to make use of them are invited to correspond with the undersigned, outlining with as much detail as possible the work they desire to do at the Garden, and giving timely notice so that provision may be made for the study of special subjects. Those who have not published the results of original work are requested to state their preparation for the investigation they propose to undertake.

Under the rules of Washington University, persons entitled to candidacy in that institution for the Master's or Doctor's degree may elect botanical research work as a principal study for such degrees, if they can devote the requisite time to resident study.

WILLIAM TRELEASE,
Director.

ST. LOUIS, MO., May 8, 1895.

Botanical Notes.

The Pignuts. There is some question as to the exact distribution of the Common Pignut (*Carya porcina* or *Hicoria glabra*) and the related *Carya* or *Hicoria microcarpa*, and the undersigned will be grateful for herbarium specimens and especially nuts with their husks, representing both. In the recently published seventh volume of Professor Sargent's Silvaa, the range of *glabra* is given as southern Maine to southern Ontario, through southern Michigan to southeastern Nebraska, southward to the shores of the Indian River and Peace Creek in Florida, and to southern Alabama and Mississippi, through Missouri and Arkansas to eastern Kansas and the Indian Territory, and to the valley of the Nueces River in Texas. *H. microcarpa* (treated in the Silva as a variety of *glabra*, under the varietal name *odorata*) is said to occur in eastern Massachusetts, Connecticut, eastern and central New York, eastern Pennsylvania, Delaware, the District of Columbia, central Michigan, southern Indiana and Illinois and Missouri.

WILLIAM TRELEASE.

Reviews.

A Monograph of the Mycetozoa. Arthur Lister, F. L. S. London. Printed by order of the Trustees of the British Museum.

Rostafinski's monograph of the Mycetozoa appeared in 1875, and with the appendix described about 230 species. Massee's "Monograph of the Myxogastres" was published in 1892; it enumerates 430 species. Lister's volume comes to us dated 1894; it furnishes descriptions of 174 species "taken from specimens I have personally examined," and a list is appended at the end of each genus of "species not met with in the quoted collections;" this comprises about 100 species.

The basis of work in all three of these monographs is the same, viz.: *the types of the species of Rostafinski's monograph* in the collections at Kew, in the British Museum and at Strassburg. Of course the continued accession of specimens to these herbaria has augmented the material of each succeeding author, and important contributions appear to have been made to Mr. Lister's resources by several parties on this side the water.

Rostafinski, by reason of his original method, which involved a complete reorganization of the classification, necessarily reduced numerous species of the old writers to the condition of synonyms. Massee in general accepted the species as established by Rostafinski, while at the same time making numerous additions to this list from descriptions and material derived from American sources and elsewhere. Lister, however, while professing to follow in the main the arrangement of orders and genera given by Rostafinski, opens up afresh the question of species and proceeds to make a thorough and complete revision of the works of his predecessors. Upwards of *eighty* of the species of Rostafinski's monograph have disappeared in synonomy, united with other species, becoming reduced two, three and four or more into one. This involves at the same time the abolition of *five* of the Rostafinskian genera.

The manner in which species and genera are disposed of is sometimes remarkable. For example, it is suggested that the single species of the genus *Crateriachea* is but a variety of *Physarum cinereum* Batsch, and "a careful examination of the type specimen of *Heterodictyon mirabile* Rost. leads to the conclusion that it is a form of *Dictydium umbilicatum* Schrad." On page 89 eight Rostafinskian species are excluded from the genus *Chondrioderma,* four of them being unceremoniously dumped into *Trichamphora pezizoidea* Jungh; the single species of this genus is composed of five species of Rostafinski and one of Massee.

Of the numerous American species of Berkeley and Curtis, all but two or three subside into synonomy. Peck and Rex come off a little better, a paltry half dozen or so being graciously allowed to remain to each. It is George Massee, however, who has to bear the brunt of the crush and to suffer the most acutely. Out of upwards of fifty new species named and described by him, only a single one is allowed to live, with the exception of two or three which are permitted to linger along until Lister can lay his hands on the types. This, too, it will be observed, is in addition to the Rostafinskian squeeze, the sum of which leaves Massee's volume in a sad state of collapse.

If the details of Lister's book are accurate and reliable, and the work is to be accepted as authoritative, then Massee's volume is a tissue of mistakes and blunders and a monument of ignorance—and *vice versa.* There is scarcely an agreement in spore measurements under any of the species, and the discrepancies are often immense. For example, the spores of *Lamproderma irideum* Massee are given in one volume as 11–15 μ, in the other as 6.5–8 μ. The measurements of sporangia exhibit the same diversity. Species appear under one genus in the one volume and under an entirely different genus in the other. *Didymium flavicomum* of Massee becomes *Physarum Berkeleyi* of Lister. The difference in treatment of the elegant genus, *Trichia,* by the two is something appalling; the number of species described by Massee is *thirty*, while Lister recognizes but *ten.* Massee's single genus, *Heterotrichia,* the only one he ventured to establish, is incorporated in *Arcyria ferruginea* Sauter. Two of Massee's species of *Lycogala* are excluded from the Mycetozoa! And *Tubulina spumarioidea* Cooke & Massee is declared to be nothing but the common fungus *Sepedonium chrysospermum* Lk.! The number of species that are occasionally got together sometimes rivals the synonomy of Rostafinski, and possibly a righteous retribution has now fallen on him for having made such havoc with the species of the old writers. For example, in *Physarum compressum* A. & S. are dumped four of Rostafinski's species, two of Berkeley's, three of Massee's and one each belonging to Balfour, Phillips and McBride. *Oligonema nitens* Libert is made a dumping place for eight different species, and he seems to have seriously considered whether he shouldn't dump the whole into *Trichia affinis* De B.

Mr. Lister has made a few attempts at novelties himself, which in the main are unfortunate. It is doubtful if *Physarum murinum* Lister is anything different from *Physarum pulchripes* Peck, as he has it. *Physarum calidris* Lister, on his own showing should be called *Physarum pusillum* B. & C., and the pretext for not doing so is perfectly flimsy. At any rate *Physarum nodulosum* Cke. & Balf. has priority; it was published as *Badhamia nodulosa* in the Journal of Mycology in 1889. If *Hemiarcyria stipitata* Mass. is to be absorbed in *H. clavata* Pers., with more reason should *H. intorta* Lister be included in the same species. The definition of his new order Margaritaceae is illogical; in fact, the order is unnecessary and the genera may easily be distributed elsewhere. The theory of the tubules in *Lycogala* is questionable; but if true the tubules are not a capillitium traversing the *interior* of the sporangia, but only "air-spaces" between them, in which case *Lycogala* goes to Reticulariaceae. The placing of *Chondrioderma* and *Diachaea* in Physaraceae is awkward indeed, and will receive the approval of no one. *Hemiarcyria* is a good Friesian designation much older than *Hemitrichia*. Something is said in the introduction concerning the "laws of botanical nomenclature," but it will be seen that the nomenclature remains a purely *personal* one, and that revision of the generic and specific names in the Myxomycetes is still a thing greatly needed.

We are of the opinion that Mr. Lister has shown too little respect for the labors of his predecessors and has exhibited a great want of consideration for the views and opinions of his contemporaries. We have a lurking suspicion that he is influenced by some strong personal bias greatly to the discredit of many of his statements; possibly it is only a yearning for notoriety. And we are inclined to look upon him as a narrow specialist, disqualified, by reason of his limited studies, for forming a proper judgment concerning genera and species. A. P. M.

Untersuchungen über die Stärkekörner. By Dr. Arthur Meyer. With 99 cuts in the text and 9 plates. Jena, 1895.

This treatise will no doubt be welcomed by all scientific botanists. The author has made an earnest, conscientious effort to clear up some of the mysteries concerning the life history of the individual starch-grain. He admits that some of his conclusions in regard to structure, imbibition, stratification and growth are yet theoretical. Our knowledge concerning the chemistry of starch is especially imperfect. It would be impossible to attempt to give a full summary of the author's investigations and results. The following are perhaps the most important conclusions:

1. The starch-grain consists of amylose, which separates into α-amylose and β-amylose, amylodextrin, dextrin, isomaltose, and maltose. Of these substances amylose is perhaps the true starch-substance; the others are the result of processes of inversion.

2. Starch-grains are sphaero-crystals of amylose and amylodextrin. This is evident from their optical behavior.

3. Amylose is split up by the starch-ferment diastase as follows: with the aid of water, the amylose molecule is converted into two or more molecules of amylodextrin; this is converted into dextrin and isomaltose; a further process of splitting up converts dextrin into maltose, while isomaltose may also revert into maltose.

4. The starch-grain is porous. The pores are scarcely perceptible with the highest magnifying powers. The author makes a special attack upon Bütschli's "Wabenstructur" theory. Among other things he says, "Es ist höchst interessant zu sehen wie ein so vortrefflicher Beobachter (Bütschli) die Schaum und Wabenstructur mit welcher er sich eingehend beschäftigt, in die Objecte hinsieht," which, I think, expresses it rightly.

The following are some of the more important conclusions in regard to the biology of the starch-grain.

1. Starch-grains occur exclusively in the chromatophores. They may occur in any kind of chromatophore. The starch-grain of angiosperms originates and grows from the beginning until its final solution within a chromatophore.

2. Every starch-grain is entirely enclosed by the substance of the chromatophore. The author points out the difficulty of demonstrating the presence of the chromatophore substance.

3. The form of the starch-grain is more or less dependent upon the form of the chromatophore. The chromatophore substance does not always form an even layer over the starch-grain. The thickest portion of the chromatophore always lies in contact with the thickest stratifications of the starch-grain.

4. Several starch-grains may develop in one and the same chromatophore.

5. Solution of the starch-grain within the cell is due to the ferment diastase.

6. Stratification of starch-grains is still not well understood, it is perhaps due to a periodicity of growth (deposition of new layers), and to the action of diastase.

Part IV. comprises monographs on the biology of the starch-grains of *Adoxa moschatellina*, *Hordeum distichum*, *Dieffenbachia Seguine*, *Pellionia Daveauana*, *Hyacinthus orientalis*, *Oxalis Ortgiesi* and *Cyrtodeira cupreata*.

The treatise, which comprises 318 large octavo pages, is written in clear scientific style. Some of the cuts are poor. Taken as a whole, it is certainly the standard work on starch. It shows a great advance made since Nägeli's memorable communications on the same subject. ALBERT SCHNEIDER.

Catalogue of Ohio Plants. W. A. Kellerman and William C. Werner (Geology of Ohio, 7: Part 2, 56–406. 1895).

Since the publication of Dr. Beardslee's "Catalogue of the Plants of Ohio" in 1874, a great amount of botanical exploration and critical study of the flora of the State has been accomplished, no less than 110 published papers and references to the plants of the area, during that period, being cited in the work here noticed. It was therefore highly desirable that these records should be brought together and incorporated with the unpublished results of the recent work of Professor Kellerman, his students and associates in the region. The duty has been discharged in a thorough and painstaking manner, as evidenced by the fine volume which lies before us, and we tender its authors the cordial congratulations of American botanists upon its completion.

The chapter on bibliography cites the titles of 132 papers and references, all but two or three of which have been examined. The arrangement of the families is that of Engler and Prantl, but in a reverse sequence, beginning with the Compositae and ending with the Myxomycetes. The nomenclature is based on the principles adopted by the Botanical Club of the American Association for the Advancement of Science. N. L. B.

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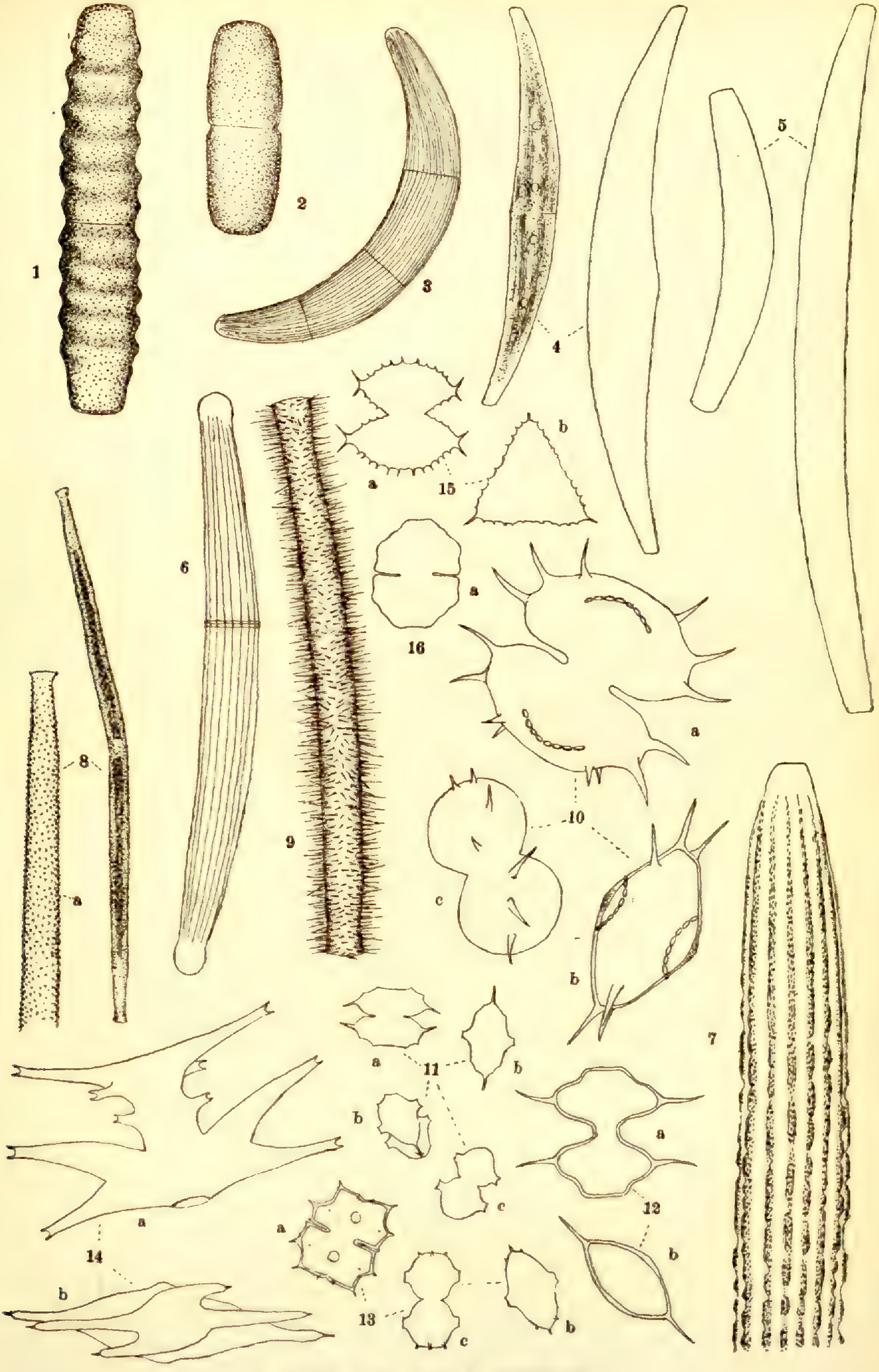
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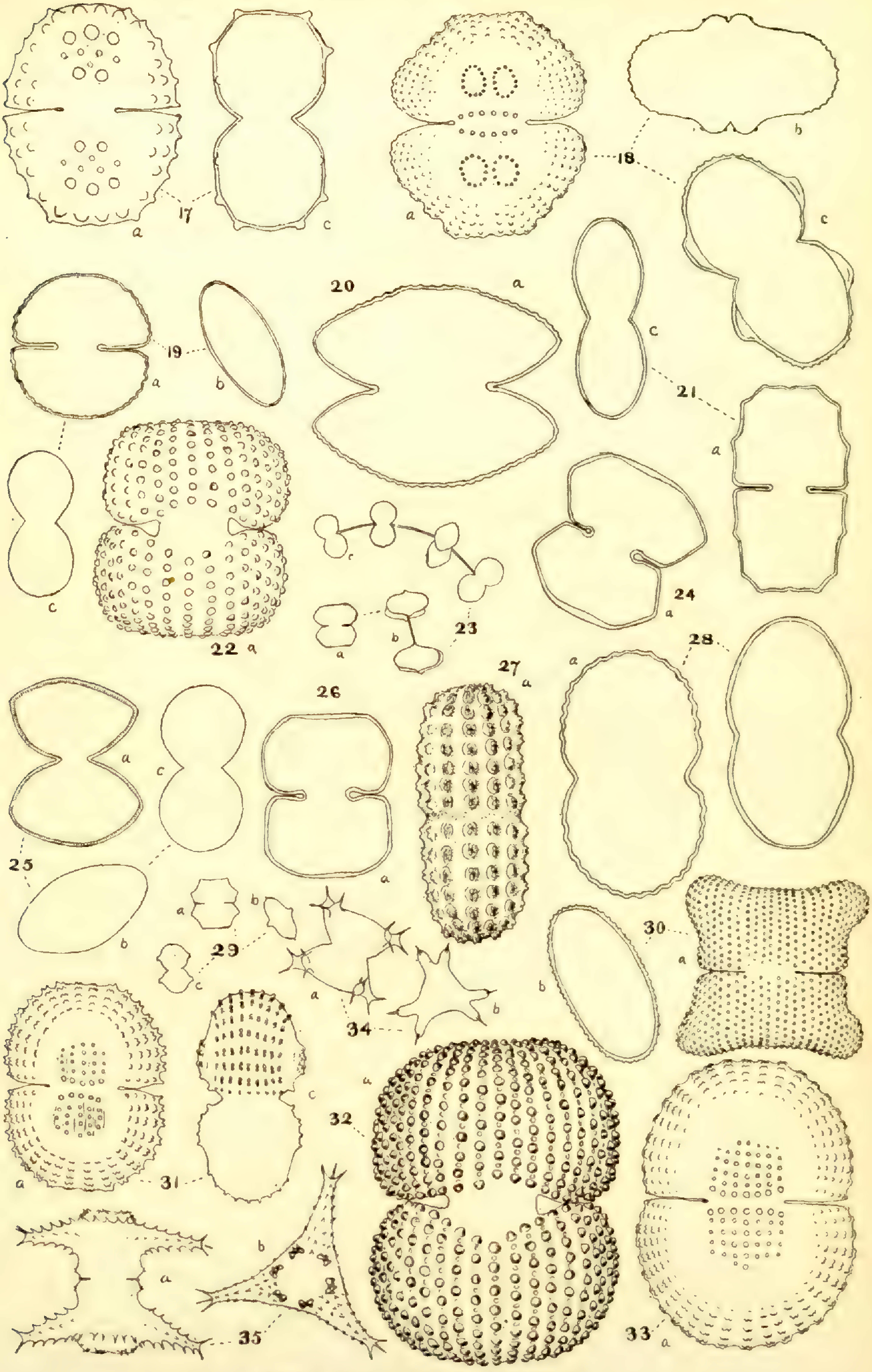
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VOL. 22. AUGUST, 1895. NO. 8.

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A MONTHLY JOURNAL OF BOTANY.

EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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Daniel C. Eaton

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OF THE

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Vol. 22. Lancaster, Pa., August 31, 1895. No. 7.

Daniel Cady Eaton,

1834–1895.

By William Albert Setchell.

(With portrait.)

The death of Prof. Daniel C. Eaton, at his home, in New Haven, on June 30, 1895, removes from among us the last link intimately connecting the systematic botany of the present with that of the past. During the first half of the present century the most influential writer upon, and teacher of, botany in this country was Amos Eaton, Senior Professor of the Rennselaer Institute at Troy, N. Y., and grandfather of the subject of our sketch. His Manual was the inspiration and guide of our earlier botanists, and continued to be until supplanted by the works of Torrey and Gray. The botanists earlier than and contemporaneous with Amos Eaton were writers of Floras, but Amos Eaton, himself, was a teacher of great ability and awakened, even among the members of the New York Legislature, so it is said, a deep and widespread interest in natural history. From him John Torrey learned the rudiments of botany, and was able to broaden and deepen the knowledge and interest in botanical things of Asa Gray, whose first knowledge of the subject came from Amos Eaton's text-books. Of Gray's influence upon the botany, not only of this country, but of the world, it is needless to speak, so present is it with all of us. Of Gray's associates and pupils two were more intimately thrown together than any others, and these were Daniel C. Eaton and Sereno Watson. With them we may say, perhaps, that the direct line of succession ends. Others there are, no less illustrious, but they have departed more widely than these two from the direct line of work, and the mantle, while it has fallen upon most worthy shoulders, yet lacks the accumulated traditions which were a precious heritage in themselves.

Daniel C. Eaton, as he was called to distinguish him from his cousin, D. Cady Eaton, was the son of Amos B. Eaton and Elizabeth Selden, and was born at Fort Gratiot, Mich., on February 12, 1834. His father was an officer in the Regular Army of the United States, had served with distinction in the Seminole and Mexican Wars, had risen to the office of Brigadier General, and was entrusted with the very important work of supervising the Commissary Department as Quartermaster General during the Civil War. Although he never had any special scientific education, as had a sister and a brother who became teachers in these lines, yet he possessed a keen interest in natural history and helped to direct his son's education whenever the roving life of an army officer allowed him to do so. Mrs. General Eaton was a sister of Samuel K. and Henry R. Sheldon, two distinguished jurists of Rochester, N. Y.

Daniel C. Eaton's early training was obtained in different places. For a time the family resided in New York City, and during the Mexican War the mother and children remained at Rochester. Later he attended the Rennselaer Institute for a short time and General Russell's Military School in New Haven, while preparing for college. His final preparation was made with a private tutor, and he entered Yale in the autumn of 1853.

During his college course he distinguished himself particularly in Latin, and he retained during the rest of his life an especial fondness for this language and its literature. But his chief interest lay in botanical pursuits, and this distinguishing trait is a prominent feature in the recollections of his classmates with whom he was a great favorite. He never had a doubt as to his future vocation, and his ambition was to become the professor of his favorite subject in his alma mater, the institution where his grandfather had received a part of his own botanical and chemical education under Professors Silliman and Ives.

During his undergraduate days he derived much pleasure and profit from his correspondence with Torrey, Gray and Sullivant, to whom he sent his specimens and to whom he applied for counsel. His herbarum still contains many of these specimens with notes from these distinguished authorities. Such was his advancement even then that in his junior year he published a short paper in "Silliman's Journal" on three new ferns from California, his first contribution to science upon a group to which he devoted later his chief attention.

He obtained the degree of B. A. from Yale College in 1857, and spent the three succeeding years in the Lawrence Scientific School of Harvard University in special botanical studies, under the direction of Professor Asa Gray. He devoted himself particularly to the study of the ferns and produced several papers. He enumerated and described the new species of ferns from the collections made by Charles Wright of the Rodgers Exploring Expedition in Cuba and Japan, for Torrey's Flora of the Mexican Boundary Survey and for Chapman's Flora of the Southern United States. Finally, in 1860, he presented to the faculty of Harvard University, as his thesis for the purpose of obtaining the degree of Bachelor of Science, his "Filices Wrightianae et Fendlerianae."

During the Civil War his botanical studies were interrupted and he held the position of clerk and inspector of stores in the Commissary Department of the United States Army in New York City. He, however, had an opportunity of associating more intimately with Professor Torrey and of increasing his store of botanical tradition.

After the war, in 1864, he was elected to the chair of botany in Yale College, which had been established by some of his friends, and his duties were assigned to the Sheffield Scientific School, with which he continued to be principally identified. A few years later he was appointed University Professor, and continued to give instruction in both departments until the end of his life. He took up his residence in New Haven in the fall of 1864, and in 1866 he married Caroline, daughter of Treadwell Ketcham, of New Haven. Mrs. Eaton, a son, and a daughter survive him.

Professor Eaton made two trips to Europe, one early in 1866 and another in 1887. As the later trip was taken for the benefit of his health, he visited little and indulged in practically no botanical study. In 1866 he visited the botanists and botanical collections at Florence, at Geneva, at Paris, and in London at the British Museum and the gardens at Kew. At the latter place he spent two weeks in the careful study of ferns, working assiduously among the collections, every courtesy and every assistance being rendered him by Sir Joseph Hooker, then Director of the Royal Gardens.

He took many collecting trips, especially into New Jersey, with Gray, Canby and others, to the White Mountains of New Hampshire, and a portion of the last summer of his life was spent at Shelburne, N. H., with Professors Farlow and Penhallow in collecting the *Sphagna* of that region. During the summer of 1869 he spent a month botanizing among the mountains of Utah, as the guest of Clarence King, who was in charge of the geological surveys of the fortieth parallel.

Even in his undergraduate life his preference for the cryptogamous plants was marked, and he will be remembered chiefly for the work he did among them. His knowledge of the phaenogamous species, nevertheless, was very extensive and exact. He preferred, however, to entrust the work of publishing upon these plants to Professor Gray. His attainments in this line are shown, however, in the masterly way in which he has treated the *Compositae* of King's Expedition, and the additional material and other aid afforded by him in the preparation of the whole of the botany of that expedition is gracefully and effectively set forth in Watson's general introduction. Besides this work his published observations on the flowering plants are few, although he retained much interest in them even until the last.

His chief work from the beginning (1856) until about 1883 lay among the ferns and their immediate allies. His first several papers were devoted to enumerations of various collections of ferns and descriptions of new species. He contributed the accounts of the Vascular Cryptogams to Torrey's Botany of the United States and Mexican Boundary Survey, to Chapman's Flora of the Southern United States, to Gray's Manual of Botany of the Northern United States (both to the 5th and the 6th editions), to Gray's Field, Forest and Garden Botany, to the Botany of

King's Survey, to that of Wheeler's Survey, and to the Botany of California.

In 1873 he began a series of notices of "New or Little Known Ferns of the United States," directly leading up to his great work on "The Ferns of North America." This classic and and well-known work consists of two royal octavo volumes containing 683 pages and illustrated by 81 colored plates, after drawings by Emerton and Faxon, representing 149 species, all that were known at the time from North America north of Mexico. They were issued in 1879 and 1880, but the notes on ferns in the BULLETIN of the Torrey Botanical Club were continued actively until 1883, after which there were very few articles from his pen on this subject.

He was for many years much interested in Algæ and spent a considerable time upon them. He spent a portion of one summer with the United States Fish Commission at Noank, engaged in the study of this group. He published very little upon them, however, limiting himself to a list of Eastport Algæ, another of those collected by Edward Palmer in Florida and the Bahama Islands, and directions for mounting and preserving specimens. He was associated with Professor W. G. Farlow and Dr. C. E. Anderson in issuing the Algae Americae-Borealis Exsiccatae.

The later years of Professor Eaton's life were devoted to the study of the mosses and liverworts. His interest in these plants was well advanced even in his undergraduate days. He collected much and carried on a considerable correspondence with W. S. Sullivant in regard to the determination of his specimens. His knowledge of the New Haven Moss and Hepatic Flora was very extensive, and he contributed the account of these plants to the Catalogue of Plants growing within 30 miles of New Haven, pubpublished by the Berzelius Society of the Sheffield Scientific School in 1878. His other publications on these groups are confined to lists of Patagonian species and a few notes on new or rare species of the United States.

He spent a great deal of time in the study of the Hawaiian species, both of Mosses and Hepatics, and had almost completed the determination of the species of the various collections in his possession. He spoke to the writer only a few weeks before his death of issuing a list with notes and descriptions of new species. His collection of Polynesian Mosses is very large and complete.

For a number of years he had been collecting and studying the various species of the genus *Sphagnum*. In 1893 he issued a list of the North American species and a prospectus of a proposed distribution, undertaken in connection with Mr. Edwin Faxon, to be called "Sphagna Boreali-Americana Exsiccata." He spent much time in collecting, preparing and determining sets, and was very particular about the excellence and homogeneity of his specimens. Many of the sets are practically ready for distribution, and it is to be hoped that these, at least, may be issued at some future time.

Professor Eaton prepared the botanical definitions for Webster's International Dictionary, and contributed many reviews of botanical books to the various periodicals. During the last four or five years he has contributed the botanical reviews to the "Nation" and to the "New York Evening Post," touching upon current botanical changes and opinions in the graceful and discerning way characteristic of him.

Professor Eaton was one of the original members of the Torrey Botanical Club, and remained an active member for a number of years. Later he became a corresponding member. He was a regular and active contributor to the BULLETIN, especially during the earlier years of its existence.

Besides his botanical interests Professor Eaton had many others. He was an enthusiastic lover of athletic sports, of archery, of baseball and football, and of fishing and hunting. He was an ardent student of anthropology and genealogy. He was a member of several genealogical societies and made a considerable study of the genealogies of the Eaton and Selden families, and published the results in several papers. He was also Governor of the Connecticut Society of the Colonial Wars for some years.

In politics Professor Eaton was a Republican until 1884, but from that time took an active part in the independent movement in Connecticut.

His interest in the classics, both of the Latin and of the Greek, was very great, and he much deplored the present lack of facility and even use of proper Latin, both in the choice of generic and specific names and in descriptions. He strongly advocated the publication of a Latin description in the case of a new species. He was very impatient of the use of barbarisms in Latin nomenclature.

As a man, Professor Eaton was possessed of a most pleasant personality, winning the esteem and love of all who had the privilege of acquaintanceship with him. He was generous to the extreme and counted neither time nor trouble when performing any act of friendship.

As a botanist he was careful to an extraordinary degree. No work of his was ever slovenly or hastily done, and he had little sympathy with work of that kind on the part of others. His instruments were most carefully kept in order, his microscopic preparations most neatly prepared, finished and labelled, and all the results of his study compared and worked over and over again. His extraordinary severity in these matters led him to publish much less than he otherwise might well have done.

Professor Eaton was very conservative in regard to changes in scientific methods and views. He was loth to part with what he considered good until he was absolutely convinced that he might obtain something better. But when the better had really been demonstrated he lost no time in changing either views or methods. His attitude toward the various proposed changes in the rules for governing the nomenclature is a good case in point. While anxious that there should be no blind adherence to rules already established, and perfectly ready to accept such changes as might lessen such confusion as already really existed, he viewed retroactive measures overturning hosts of names already long and firmly established in the literature as productive of great immediate confusion without giving by any means a certain promise of surer criteria upon which to establish stability in the future; in fact as giving no greater certainty, if as great, as that given by the rules already existing and followed for years by the best workers.

As a teacher he was kindly and inspiring, not suited to manage large classes of unwilling students, such as often fell to his lot, where much sternness and rigor was needed to compel the wavering attention and to force the stubborn mind to effort, but especially fitted to encourage and to train those desirous of pursuing either some especial line or even of obtaining a general botanical education. To these he tendered the privileges of his library and collections, which had to be supported by himself alone, and opened to them not only all the material resources at his command, but unlocked for them all the treasures of his own experience, the results of the patient study of many years.

Professor Eaton's religious views were shown rather in the earnestness and simplicity of his life than by any profession of faith. Where he could not thoroughly understand and believe he was contented to hope, and his last months, even during intense suffering, were hopeful and peaceful, and he left this life calm in his trust in the good to come. He was a communicant of the Episcopal Church, and attendance upon divine worship was to him a pleasure and an inspiration rather than a duty. At his particular request, his funeral services were of the nature of simple religious consolation to his relatives and friends, with an entire absence of official ceremony.

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[Reprinted without change in the 2d Edition, 1885.]

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* The basis for the present list was taken from the "Bibliographies of the present officers of Yale University," edited by Prof. Irving Fisher (New Haven, 1893). The list of works there given was written out by Prof. Eaton. This has been followed in the main, but the greater part of the references have been compared and some changes and additions made. The writer is very much indebted to Mrs. Eaton, to Mr. George F. Eaton and to Prof. W. H. Brewer for much help, both in connection with the details of the bibliography and of the sketch of the life of Prof. Eaton.

enumeratae novaeque descriptae: dissertatio inauguralis, quam in auditorio botanico Universitatis Harvardianae ad gradum baccalaurealem in scientiis legitime obtinendum die XIV. Jul. MDCCCLX., habuit Daniel C. Eaton, A. M. Mem. Acad. Amer. Scient. et Artium. (II.) **8**: 193–218.

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The Genus Sanicula in the eastern United States, with Descriptions of two new species.

BY EUGENE P. BICKNELL.

(PLATES 241–245.)

It has been generally received as a settled fact of our geographical botany that the genus *Sanicula* had but two representatives in the flora of eastern North America. These plants, *S. Marylandica* and *S. Canadensis*, though coming down to us as well-accredited species from the time of Linnaeus, have proved a recurring source of confusion to our botanists and, as now appears, have never been rightly understood. In 1824 Dr. Torrey reduced *Canadensis* to a variety of *Marylandica* (Fl. U. S. 302), and in 1838 Torrey & Gray (Fl. N. Am. 1: 602) discredited the plant altogether naming it as a synonym of the latter species. A few years later, however, Dr. Torrey took occasion to restore the plant to its original status, remarking that he had become persuaded that the two species were quite distinct (Fl. State of N. Y. 1: 265); notwithstanding this, recent authorities have reverted to Dr. Torrey's earlier view. In the "Review of North American Umbelliferae, Coulter & Rose" (1888), *S. Canadensis* finds recognition only as a slightly differentiated form of *S. Marylandica*, a disposal of the plant which is followed in the sixth edition of Gray's "Manual"

(1893). Dr. Britton, however, in his "Catalogue of Plants found in New Jersey" (1889), again accords both plants full specific rank. That this understanding of the problem is the only one which the facts allow does not admit of any question whatever. The most zealous reductionist need have no trouble in assuring himself of this, provided only that ordinary eyesight and an open mind be not wanting to his equipment. Indeed, as species present themselves, these two plants must be regarded as not even very closely related within their common genus. The trouble all along has been that we have unwittingly been seeking to force *four* distinct species into the limits defined for two. As an inevitable result these two, though wholly distinct, have been seen under such confused outlines as to make it appear quite impossible to assign any constant characters to either. It thus becomes necessary to diagnose them anew in connection with the description of their long over-looked congeners.

It has not been ventured to define two new eastern species of this difficult genus without considering very carefully their relationships with the species already known, at the same time keeping in mind the harmfulness of distinctions too finely drawn. The danger of fallacious distinctions, however, proves not to press at all closely in the present case. A critical study from herbarium specimens of the four plants here presented, which has supplemented an intimate acquaintance with three of them in the field, enables me without any reservation to subscribe them all as authentic and well-defined species.

Sanicula Marylandica L.

Commonly two or three feet high—one-and-a-half to four feet; stem single, or two or three together from the same rootstock, terminating in a general umbel which is usually but ⅛ to ¼ the length of the entire plant; there is frequently also a short, imperfectly umbellate lateral branch. Leaves thickish, dull bluish green, two or three on the stem between the basal leaf and the involucre; basal leaves several, on long erect petioles, only one of them cauline, the others rising separately from the rootstock; free stem-leaves nearly or quite sessile, or the lowermost short-petioled; involucral leaves usually much reduced, sometimes under an inch long, cleft or parted, not divided into separate leaflets; larger leaves five-divided, appearing seven-divided from the deep partition of the basal leaflets; upper leaves five-divided, or appearing so. The leaves generally are large, spreading from three or four to eleven inches, the leaflets reaching a size of six inches by three; leaflets variable in shape and marginal pattern; cuneate-obovate, to oblanceolate, or sometimes elliptic, obtuse or acute, irregularly doubly serrate, serrate or dentate-serrate, with mucronately-pointed teeth, usually more or less incised-lobed towards the apex. Branches of umbel rather rigid, usually sharply ascending, normally three—two to four—and sub-equal, two to eight inches long; ultimate rays three, an inch long—3″–18″—(abnormally longer and bearing a pair of minute bracts) sometimes divaricate; rarely the umbel may be unevenly three times compound; secondary involucres of firm foliaceous bracts, either cut-lobed or merely serrate, often minute, rarely reaching a length of one inch. Sterile flowers numerous, with the perfect flowers, or in separate peduncled capitate clusters; pedicels 2″ long; calyx 1″, cleft nearly to the base into narrowly lanceolate attenuate-cuspidate lobes; petals oblanceolate, equalling or slightly exceeding the sepals, greenish-white, as are the anthers; filaments exserted, 2″ long; umbellets at anthesis 5″–7″ wide. Fruits large, 3–6 in each umbellet, somewhat ovoid, sessile, spreading, the body 2″ long and nearly as broad or, through the bristles, 3″–5″ wide, 3″–3½″ high; bristles numerous, crowded, arranged in no regular order, very straight to the minutely hooked apex, prominently corky-bulbous below, rudimentary at base of carpel, above becoming 2″ long, ascending, the uppermost erect, parallel with and about equalling the erect calyx-lobes; styles long, at first erect-spreading but early recurving from the top of the closed calyx sometimes quite outside of the bristles. Transverse section of seed somewhat oblong, seed-face plane or slightly concave, dorsal surface more or less fluted or grooved for the partial accommodation of the five large oil-tubes; frequently a slight separation of the wall of the pericarp from the middle of the seed-face leaves a cavity having the appearance of an additional oil-tube; pericarp corky-thickened, pale brown; commissural scar broad, elliptic. Root perennial, of very coarse fibres fasciculate from a short knotted contractedly-branched rootstock, which, when cut, has a distinct terebinthine odor.

Newfoundland and Canada, southward to the mountains of Georgia, west to the Rocky Mountains. (Plate 241.)

A specimen of a *Sanicula* which, for the present, must be regarded as an aberrant form of this species was gathered on Lookout Mountain, Tennessee, June 21, 1894. The plant is small and has two very unequal branches, one capped by a single umbellet, the other bearing an umbel of four divaricate rays; the leaves are ***trifoliate***, with obovate nearly simply-serrate leaflets, the lateral ones deeply cleft; the three stem leaves are slender-petioled, even the involucral leaves are short-petioled. The immature fruit when crushed exhales an odor much like that of the herbage of the carrot, and very different from that of true *Marylandica*. The styles are shorter than normally, and not recurved, and with the stylopodium are perfectly developed in all the infertile flowers, which are further noteworthy from their rigidly spreading sepals.

I have observed no other instance of styliferous sterile flowers in any of our eastern *Saniculae*, though an examination of specimens of *Sanicula Europaea* show that they occur normally in that species.

So far as an inference may be drawn from this single specimen, we may suspect the existence in the Southern Alleghenies of still another form of *Sanicula* meriting definite recognition.

The plate of *S. Marylandica* in "The Flora of the State of New York" well illustrates the confusion that has prevailed with regard to this species. The large leaf in outline, together with the single bristle, the mature carpel and the fruit section, are of *S. Marylandica;* the figure of the upper part of a fruiting plant, and the detached umbellet, are good representations of *S. gregaria* as here distinguished.

SANICULA GREGARIA n. sp.

Stems rather weak, often clustered, from one to three feet high, commonly two to two-and-a-half feet, naked to the first branch or with a single petioled leaf, above dividing into a freely branched three or four times compound general umbel which takes up usually ¼ to ½ the length of the plant. Basal leaves usually more numerous than in *Marylandica*, sometimes nearly as large and as long-petioled, only one of them truly cauline, the others rising from the rootstock near the base of the stem. Leaves thin, bright green, digitately five-divided, the divisions all petiolulate, or the lateral pairs slightly united at base; leaflets varying from cuneate-obovate, through rhombic, to elliptic and lanceolate, sharply doubly-serrate with bristle-tipped teeth, often regularly serrate-lobed along the margins, sharply incised-lobed above, acutely-pointed; involucral leaves scarcely reduced, trifoliate, the petiolulate leaflets commonly lanceolate, often somewhat curved or sub-falcate; involucres of the second, and even of the third, series conspicuously foliaceous, the former three-divided, and sometimes spreading four or five inches, the latter merely lobed. Branches of general umbel, with their divisions, commonly in sub-equal series of three, sometimes of two, slender, straight, ascending, the ultimate rays 6″–15″ long or, occasionally, much longer in effort to branch again for an umbellate division of the fourth series, which may be perfectly realized. Frequently the primary division of the stem is only sub-umbellate owing to the displacement of one of the branches; on many plants there is a well-developed lateral flowering branch. Staminate flowers with the fertile, or in separate heads peduncled in the forks of the stem or main branches; pedicles slender, 1″–2½″ long, four or five times times the length of the minute campanulate calyx, which is cleft little more than half way down into somewhat triangular-ovate rather obtuse lobes; flowering umbellets small, about 3″–4″ in diameter; petals obovate, heart-shaped, fully twice the length of the sepals, yellowish-green, filaments exserted, anthers bright yellow. Fruits very small, 3–5 in each umbellet, broader than long, and somewhat obovate in outline, measuring through the bristles 1½″–2″ high, by 2″–2½″ wide, evidently pedicelled, pedicels not over 1″ long, papillose with rudimentary bristles; bristles of the fruit very small and weak, rudimentary at base of pericarp, gradually lengthened above, but not exceeding 1″, and commonly half that size, not crowded, arranged in eight or ten rows which may be evident or obscure, curved at tip into a more open hook than in *Marylandica*; though sometimes slightly depressed-dilated at base, they commonly rise abruptly from the nearly even surface of the mature carpel, which is of a dark or blackish color; fruit reflexed at maturity; styles abruptly spreading and recurved among the bristles, sometimes extending more than half way around the fruit. Seed rounded-oblong in cross-section, dorsal surface even, not at all sulcate or angled, commissural face plane; pericarp thin and membranous, closely investing the seed; oil-tubes five, very small; commissural scar linear. Rootstock much as in *Marylandica*, but not so stout and contracted, the fibres less fasciculate, much more slender and fibrillose, and of a blackish instead of brownish color. The substance of the rootstock has a fainter and altogether different odor. (Plate 242.)

This plant when once known is in no danger of being confused longer with either *Marylandica* or *Canadensis*. It is clearly a perfectly distinct species, not even to be regarded as intermediate between the other two, nor as related to them by any nearer ties than those of a common genus. Its nearest affinity is with *Marylandica*, with which it has been mainly confounded, notwithstanding that the general aspect of the two is strikingly dissimilar. To compare the superficiary characters, *S. gregaria* is a less robust plant, more widely branched and more leafy above, but with less leafy stem, quite missing the general appearance presented by *Marylandica* of a tall strict plant stiffly umbellate at the top of a simple stem. The general umbel of *gregaria* is more compound and much more slenderly branched and foliaceous; the leaves are thin and bright green, in contrast with the firm and dull or bluish-green leaves of *Marylandica;* furthermore the leaves of *gregaria* are never seven-divided, nor are the basal leaflets parted or deeply cleft, as seems always to be the case with both *Marylandica* and *Canadensis;* the leaves, too, are more pointed, and more sharply incised and serrate-lobed than in *Marylandica*, and never assume the narrowly oblanceolate form with long tapering base so often seen in that species. In the early spring the plant forms dense clusters of leaves which may number forty or more rising from one compound rootstock. At flowering time the bright yellow anthers and yellowish-green petals of *gregaria* give the plant a characteristic appearance and distinguish it conspicuously from our other species. The flowers, moreover, have a slight fragrance faintly suggestive of those of the spice bush.

This plant seems to have escaped the observation of every one of our botanists except Dr. Darlington, who, in his "Flora Cestrica," makes an unmistakable allusion to it. Speaking of *S. Marylandica*, he says, "It also presents a *variety*, with dullish *yellow* flowers."

As already remarked, a good figure of this species appears in "The Flora of the State of New York," in the plate of *S. Marylandica.*

S. gregaria usually grows in close leafy often extensive communities, in damp low woods and thickets; *S. Marylandica* is much less gregarious, scattering itself in loose colonies through rich, often hilly or rocky woods; *S. Canadensis* often grows in a still more scattered way, and seems to prefer a simpler more earthy soil than *Marylandica*. Sometimes, however, in damp thickety spots in somewhat rocky woods all three plants may be found near together.

S. gregaria is the first of the three to flower in the spring, coming into bloom at New York from the second to the fourth week of May; *S. Marylandica* follows a week or two later, more or less; *S. Canadensis* is much later, not flowering before the third or fourth week in June, in some seasons not until July.

S. gregaria is perhaps the most common *Sanicula* near New York City, and is described from specimens collected in Van Cortlandt Park. In the Herbarium of the Torrey Club is a specimen labeled "New Durham, N. J., June 6, 1862, W. H. L. [eggett]." The specimens contained in the Columbia College Herbarium are as follows: "Virginia, Asa Gray, 1840," also bearing the stamp of the Meisner Herbarium; "Southwestern Virginia, slopes of White Top Mountain, 2600–5000 feet, collected May 28, 1892, by N. L. and E. G. Britton and A. M. Vail;" "Southeastern Virginia, Greenville County, June 19, 1893, A. A. Heller;" "Fort Riley, Kansas, May 27, 1892, E. E. Gayle;" "Arkansas, Dr. Pitcher;" "Northeastern Nebraska, June 15, 1893, Fred Clements."

SANICULA CANADENSIS L.

Usually lower and more slender than *S. Marylandica*, but sometimes even stouter and taller, one to over four feet high. Stem always single, widely branched above, and readily putting forth alternate axillary branches which, sometimes beginning at the base of the stem, may number six or more up to the terminal fork; branches ascending, naked below, their upper divisions often widely spreading, even horizontal, the whole forming an open panicle which may spread to a breadth of two feet. General plan of branching dichotomously or paniculately-umbellate, often appearing widely dichotomous throughout from the constant suppression of a third branch in each ascending series; the umbellate character of the branching is thus much less obvious than in our other species, realizing itself definitely only in the distal ramifications or in the terminal umbels; above the involucres the branching varies from definitely dichotomous and two or three times compound, to indefinitely decompound, with somewhat fasciculate umbellets; the fruit-bearing rays are only 1″–5″ long, much shorter than in any other one of the eastern species. Basal leaves from two or three to six or more, erect on long petioles, all strictly cauline; free stem leaves commonly four to eight on petioles of gradually decreasing length above, but not becoming obsolete even in the involucral leaves, or indeed, in the secondary involucres; leaves three-divided appearing pentafid from division of the lateral leaflets, or the upper stem leaves, more rarely the lower, sometimes simply trifoliate; leaflets dull green, cuneate-obovate, oblong or elliptic, often oblique, with less pronounced tendency to narrowly obverse development than is shown by *Marylandica*, and never, apparently, assuming the oblanceolate forms so frequent in that species; also, as a rule, less coarsely serrate, and much smaller, though occasionally reaching a breadth of six inches, with leaflets over 3½″ × 1½″; involucral leaves more or less reduced, even sub-bracteal, three-divided, those of the succeeding series very small and bract-like, divided or cut-lobed. Umbellets very small at anthesis, few-flowered; sterile flowers with the perfect ones, never in separate heads, few, often only one or two in each umbellet, ½″ long, on pedicels not over 1″ long, often less; calyx deeply parted, sepals narrowly lanceolate, acute or cuspidate, exceeding the minute white petals; anthers white, little exserted. Fruit subglobose, three together in one plane, the lateral spreading or slightly reflexed, very small, 1″–1½″ long and broad, or, measured through the bristles, about 2″ long by 2″–3″ wide; short-pedicelled, more distinctly so when young; pedicels ¼″–½″ long, wrinkled, striate; bristles numerous, dilated below, somewhat regularly arranged in longitudinal rows, well developed to the very base of the carpels, of more uniform length throughout than in *Marylandica*, and more spreading, rarely exceeding 1″ in length, the uppermost closely parallel with and equaling, or slightly exceeding, the erect calyx-lobes; styles small and difficult to observe, shorter than the calyx-lobes; mature fruit dull brown; commissural scar linear. Seed more rounded in cross-section than in *Marylandica*, the dorsal surface more prominently sulcate-fluted, the face convex, sometimes sharply so, and bevelled off on either side to permit a more interior position of the commissural oil-tubes than is seen in *Marylandica*. Root consisting of rigid horizontal fibres, which taper slenderly from a strong woody base.

Massachusets to Florida and Texas, west to Kansas and Nebraska. (Plate 243.)

The genus *Sanicula* is set down as consisting of "perennial herbs," yet this plant, in the vicinity of New York at least, is not perennial but apparently biennial. Unlike *Marylandica* and *gregaria*, the mature plant is readily pulled up from the soil, and in the autumn, while these species are still green, is to be found completely dead throughout, with the roots beginning to decay.

This species stands sharply apart from both *Marylandica* and *gregaria*, not only in the characters of leaves, flowers and fruit, but in fundamental differences in the root and the plan of branching. It is indeed hard to understand how such obviously distinct species could ever have been confused.

The species shows two main lines of variation which, in their extreme manifestations, present plants of somewhat dissimilar aspect. On the one hand the result is a slender plant with small fruit and leaves, the latter with finely-cut marginal pattern, the branching widely dichotomous and confined mainly to the upper part of the stem; the opposite form is coarser and stouter, with ascending or even-suberect, often simpler, branches and larger fruit; the leaves are much larger with coarser serration, and more trifoliate tendency, those of the upper stem sometimes perfectly trifoliate. An extreme example of this form in the Columbia College Herbarium, labelled "Massachusetts" in Dr. Torrey's handwriting, is the only specimen seen in which the character of short styles does not hold strictly true; in this specimen, which is in the flowering stage, the styles are longer than the sepals, and somewhat spreading, though not recurved. It is to be said, however, that this particular plant is pretty certainly abnormal; the branching is unusually coarse, and the rays and pedicels somewhat thickened, apparently indicating a tendency to fasciation.

SANICULA TRIFOLIATA n. sp.

About two feet high; branches several, alternate, ascending, or the lower often longer and suberect, simple, terminating either in the flowering umbel or in two frequently widely-spreading umbel-bearing rays, with a shorter simple ray between; rays of flowering umbels three to five, about an inch long; involucres and involucels of small serrate leafy bracts. Cauline leaves petioled, large, five to seven inches broad, conspicuously trifoliate, the broad leaflets petiolulate, ovate, elliptic-ovate or rhombic, coarsely doubly serrate with rather open, almost spinescently-mucronate teeth, or even incised-lobed, acute, the lateral leaflets mostly not at all cleft, except sometimes in the lower leaves; basal stem-leaves long-petioled, smaller than the main cauline leaves, the leaflets even slightly united at base, often obtuse, the lateral pair narrowly cleft on the lower side, but not sufficiently so to destroy the trifoliate character of the leaf. Sterile flowers few, ½″ or less long, on slender pedicels about 2″ long; sepals lanceolate, acuminate-cuspidate with slightly incurved points. Fruits sessile, three to five together, somewhat reflexed at maturity, ellipsoid or globose-oblong, large, becoming 3½″ high to tip of the erect sepals, the greatest spread of the bristles under 3″; prickles stout, swollen below, not crowded, small and reflexed at the base of the carpel, above becoming 1½″ long, and spreading or ascending; sepals on mature fruit 1″ long, united at base, appressed, echinate with sharp, slightly incurved points, raised on a slight prolongation at the apex of the fruit, and forming a conspicuous beak-like projection quite distinct from the surrounding prickles and usually a little exceeding them; styles short, nearly erect, strictly included; commissural scar elliptic, occupying most of the face of the mericarp. Seed somewhat crescentic in transverse section, the dorsal surface even, the face concave, sometimes almost sulcate; oil-tubes of two kinds, one set consisting of a pair of large vittae latero-commissural in the pericarp; the other set a series of minute ducts lining the inner face of the pericarp, especially along the commissural concavity, where they may number as many as twenty. In the dried fruit the hardened secretion of the large tubes is nearly colorless, that of the minute ducts of a reddish-amber color. Root somewhat similar to that of *S. Canadensis* and likewise, apparently, not perennial. (Plate 244.)

While in its general aspect this plant stands out clearly enough from our other species, the crucial test of fruit characters shows it to be indeed profoundly different. In fact, its fruit, in the numerous minute oil-tubes, supplemented by a large outer pair having, apparently, a different secretion, presents characters hitherto unreported in the the genus so far as I have been able to discover.

I find three specimens of this plant in the Columbia College Herbarium, and one in the Herbarium of the Torrey Club, now at the College of Pharmacy in New York. Of the former, one is especially interesting as having passed through Dr. Torrey's hands and bearing his note: "Intermediate between *S. Marylandica* and *S. Canadensis;*" it is labeled simply "Ohio." The other specimens are all named *S. Canadensis*; one is No. 835 of the Geological and Natural History Survey of Canada, and is labeled "dry, rich woods, Ontario, Amherstburg, Macoun, 5, 10, 1892;" another was collected by Dr. Britton at Indianapolis, Aug. 25, 1890. The specimen in the local Herbarium is of a complete fruiting plant and bears witness to Mr. Leggett's careful methods in botanical work; it is labeled "Canaan, Conn., '68, W. H. L." The label, however, is not in Mr. Leggett's handwriting, and, as it was doubtless copied and affixed after his death, is perhaps open to doubt as applying to the identical plant which now bears it. The localities of Ontario, Ohio and Indiana suggest a more exclusively central distribution than limits our other species, though the plant may well occur further east. I feel almost certain of having myself seen it in Alleghany County, New York, in 1891, in a flora strongly characteristic of the northern Alleghenies.

In this connection it is interesting to note that when, in 1824, Dr. Torrey reduced *S. Canadensis* to a variety of *S. Marylandica* he evidently based his conclusion upon the examination of a specimen of the very plant here described as *S. trifoliata*. This is made pretty clear by his description of his var. *Canadensis*, which was drawn up, by the way, from a specimen collected at Litchfield, Connecticut. As already remarked, Dr. Torrey afterwards revised his opinions in regard to *Canadensis* and a plate of the species occurs in his flora of the State of New York.

Descriptive Key to the eastern Species of Sanicula.

Styles long, recurved; branching definitely umbellate throughout; sterile flowers often in separate heads; perennial.

a. Fruit large, 3′′ or more high to tip of sepals, ovoid, sessile, spreading; pericarp corky-thickened; bristles stout, bulbous at base, becoming 2′′ long, but not exceeding calyx-tubes; sterile calyx 1′′ long, deeply parted; sepals lanceolate, cuspidate-acute; general umbel twice compound, ⅛ to ¼ the length of entire plant; stem-leaves two or three; larger leaves 7-divided; involucral leaves cleft; petals and anthers greenish-white, the petals oblanceolate, equalling the sepals; commissural scar elliptic; seed furrowed dorsally; oil tubes large. *Marylandica.*

b. Fruit very small, under 1½′′ somewhat obovoid, short-pedicelled, reflexed; pericarp membranaceous; bristles weak, not bulbous at base, ½′′ to 1′′ long, but exceeding calyx-lobes, sterile calyx ½′′ or less, cleft only half way down, sepals ovate, obtuse; general umbel three times compound, ¼ to ½ the length of plant; stem naked or with a single leaf; larger leaves 5-divided; involucre of distinct leaflets; anthers deep yellow; petals yellowish-green, obovate, twice the length of sepals; commissural scar linear; seed not furrowed, oil tubes very small. *gregaria.*

Styles short, included; branching mostly alternate and dichotomous; sterile flowers not in separate heads; biennial at least as to c.

c. Fruit small, under 2′′, subglobose, short-pedicelled, scarcely reflexed; bristles weak, under 1′′ long, dilated below; sepals on mature fruit inconspicuous among the longer erect bristles; pedicels of sterile flowers 1′′ or less; calyx deeply parted; larger leaves mostly 5-divided; branching more or less decompound; commissural scar narrow; oil tubes five, large; seed furrowed on dorsal surface; seed-face convex. *Canadensis.*

d. Fruit large, becoming 3½′′, ellipsoid, sessile, reflexed; bristles stout, becoming 1½′′ long; sepals on mature fruit forming a conspicuous beak-like projection free from the somewhat spreading bristles; pedicels of sterile flowers 2′′; leaves large, conspicuously trifoliate; branching once or twice compound; commissural scar broad; oil tubes of two kinds, a pair of large ones and numerous small ones; dorsal surface of seed not furrowed; seed face concave. *trifoliata.*

Plate 245 is a conventional representation illustrating the plan of branching and foliar arrangement of each of the four eastern species of the genus.

New Fungi, mostly Uredineae and Ustilagineae from various Localities, and a new Fomes from Alaska.

BY J. B. ELLIS AND B. M. EVERHART.

FOMES TINCTORIUS E. & E.

(On hemlock trees or logs?)

Admiralty Island, Alaska. Collected by James G. Swan, no. 20, 851. Comm. Frederick V. Coville, Botanist, U. S. Dept. Agr.

Pileus dimidiate, sessile, subunguliform, convex below, slaty brown, with a few elevated concentric zones, the surface of which is more or less cracked, substance flocose-fibrous, deep red, somewhat friable, superficial layer indurated, slate color, margin obtuse, 6–7 cm. long and broad, by 4–5 cm. thick. Pores large, 1–2 cm. long, 1½–2 mm. thick, same color as the inner substance of the pileus, filled with grumous matter and spores. Spores subglobose or short elliptical, red, 5–6 × 3½–4½ μ.

Resembles somewhat *F. lateritius* Cke., but pores much larger and not stratose. When ground up it looks like madder, and is used for dyeing.

USTILAGO ARENARIAE E. & E.

In the inflorescence of *Arenaria congesta* Nutt., North Park, Colo., July, 1894. Alt. 9000 ft. (Prof. C. S. Crandall, no. 119.)

Spore mass purplish-black. Spores oblong-elliptical, opaque, 14–17 × 8–10 μ, with a minute hyaline appendage at the base. The spores resemble the sporidia of *Nummularia Bulliardi* Tul.

USTILAGO MULFORDIANA E. & E.

Infesting and destroying the panicles of a species of *Festuca* while still enclosed in the sheath. Near Boise City, Idaho, June, 1892. (A. I. Mulford.)

Mass of spores nearly black. Spores when moistened globose or nearly so, 10–14 μ diam., epispore minutely roughened; when dry many of them become oblong or short-cylindrical, 10–14 × 6–8 μ.

USTILAGO MONILIFERA E. & E.

In ovaries of *Heteropogon contortus*. Tucson, Arizona, May, 1893. (Prof. J. W. Toumey, no. 2.)

Mass of spores tobacco brown. Spores concatenate, lying in parallel chains, subglobose, subcubical or subangular, hyaline at first, then brown, 8–12 μ in the longer diameter, and very minutely echinulate when highly magnified.

SOROSPORIUM SOLIDAGINIS E. & E.

Proc. Acad. Nat. Sci. Phil. February, 1893: 156.

This is the same as *S. cuneatum* Schofield, in the 2d Ed. of Webber's Appendix to the Cat. of Flora of Neb., published June, 1892.

PUCCINIA LIGUSTICI E. & E.

On leaves of *Ligusticum scopulorum* Gray. Sangre de Christo Mts., Colo. Alt. 10,000 ft. July, 1888. (Rev. C. H. Demetrio, no. 201.)

III. Sori hypophyllous, minute, chestnut-colored, erumpent and surrounded by the ruptured epidermis, densely crowded in suborbicular clusters 1½–2 mm. diam. on small, pallid spots mostly near the margin of the leaf. Teleutospores, elliptical or oblong-elliptical, obtusely rounded at both ends, pale brown, scarcely or only slightly constricted, 22–30 x 15–20 μ, epispore slightly roughened but not distinctly thickened above.

PUCCINIA NESAEAE (Ger.).

Aecidium Nesaeae Ger. Bull. Torr. Bot. Club, **6**: 47.

On leaves of *Nesaea verticillata* near Concordia, Missouri. (Rev. C. H. Demetrio, no. 145.)

III. Sori orbicular, minute, bordered by the upturned epidermis, collected in dense clusters or also scattered singly, usually clustered on the tubercular-thickened parts of the leaf previously occupied by the *Aecidium.*

Teleutospores oblong, clavate oblong or oblong-elliptical, deeply constricted, strongly thickened at the apex, usually with a hyaline papilla, pale yellowish brown, 30–45 x 12–15 μ. Pedicels stout, subhyaline, about as long as the spore.

RAVENELIA ARIZONICA E. & E.

On living leaves of *Prosopis juliflora*. Tucson, Arizona, Aug., 1894. (Prof. J. W. Toumey, no. 37.)

Amphigenous; sori erumpent, soon naked, small, black; heads not compact in the sori, orbicular, 75–85 μ diam., deep chestnut brown, hemispherical, spiny, marginal spores about 20 (18–25) in number, inner spores about as many more, 18–22 x 7–8 μ; number of spores in a cross section through the center of the head 7–9. Cystidia ovate-globose, swelling out so as to be visible around the margin of the head viewed from above. Stipe short, straight, consisting of only a few hyphae. The short, nearly hyaline spines are distributed over the entire surface of the head, about as in *R. echinata* D. & L., from which this differs in the larger orbicular heads, containing a much greater number of spores. *R. Holwayi* Dietel on the same host, has no spines. Uredospores in the same sori with the teleutospores, obovate or elliptical, rough, 23–30× 15–18 μ, pale yellowish-brown.

DOASSANSIA AFFINIS Ell. & Dearness.

On *Sagittaria variabilis*. London, Canada, July, 1895. (Dearness, 2269.)

Sori hypophyllous, pustuliform, globose or elliptical, 200–300 μ in the longer diameter, dark-colored and collapsing above, gregarious in elongated groups, the part of the leaf occupied being at first yellowish. Spores globose or elliptical, 8–10 μ in the longer diameter, epispore comparatively thin.

Differs from *D. Sagittariae* on the same host, in its larger sori and smaller less angular spores with thinner epispore. From *D. obscura* Setchell it differs in habit and character of the sori; *D. opaca* Setchell differs in its larger spores as well as in some other respects.

AECIDIUM SPHAERALCEAE E. & E.

On leaves of *Sphaeralcea angustifolia*. Las Cruces, New Mexico. June, 1895. (Prof. T. D. A. Cockerell.)

Hypophyllous, densely cespitose in clusters 2–8 mm. diam. Aecidia deep orange color, cylindrical, closed at first, then open, margin toothed, becoming entire, cups about ½ mm. high, 350–400 μ broad. Spores subglobose or elliptical, smooth, 15–20 μ in the longer diameter, orange-yellow. Spermogonia on yellowish spots on the upper side of the leaf.

Differs from *A. Callirhoes* E. & K. in its cylindrical aecidia and deep orange color.

PERONOSPORA WHIPPLEAE E. & E.

On leaves of *Whipplea modesta*, Ukiah, Mendocino Co., Cal., May, 1894 (W. C. Blasdale).

Mycelium hypophyllous, effused, dirty gray. Fertile hyphae 250–350 μ high, 3–4 times dichotomously branched, the ultimate divisions simple or bifid and usually bearing on one side a short, straight, lateral branchlet 6–8 μ long. Conidia short-elliptical, brownish, smooth, 18–22 x 12–15 μ. Oöspores not seen.

This appears to be distinct from *P. ribicola* Schrtr., the only other species recorded on Saxifragaceae.

Studies in the Botany of the Southeastern United States.—IV.

By John K. Small.

(Plate 246.)

Sieglingia Chapmani n. sp.

Wiry, slender, glabrous (except the tops of sheaths and parts of the inflorescence), bright-green, perennial by a horizontal rootstock. Culms solitary or two or three together, erect, strict, 9–15 dm. tall, mostly purple about the nodes; lower leaves rather numerous, nearly erect, 4–6 dm. long, the upper few, divaricate, somewhat shorter, all firm, flat when young, soon involute and almost filiform, 7–11-ribbed, smooth and glabrous; lower sheaths about 1 dm. long, upper ones often 2 dm. long, all ⅓–½ shorter than the internodes; ligule a short fringe of rigid villous hairs, above which, on the upper surface of the leaf, is a tuft of longer villous hairs; panicle averaging about 2 dm. high, viscid above, broadly ovoid, its branches rigid, filiform, divaricate (not drooping at the ends), the nodes tufted with bunches of silvery-villous more or less viscid hairs; spikelets very slender-pedicelled, rather few, 7–8 mm. long, tinged with purple, almost linear (when dry oblong) 5-flowered; empty glumes lanceolate, one-nerved, the lower one ¾ longer than the upper; flowering glumes oblong-elliptic, 3-nerved, 3-pointed by the excurrent nerves which are villous for ½ their length; palet 2-nerved, scabrous on the two nerves, slightly curved.

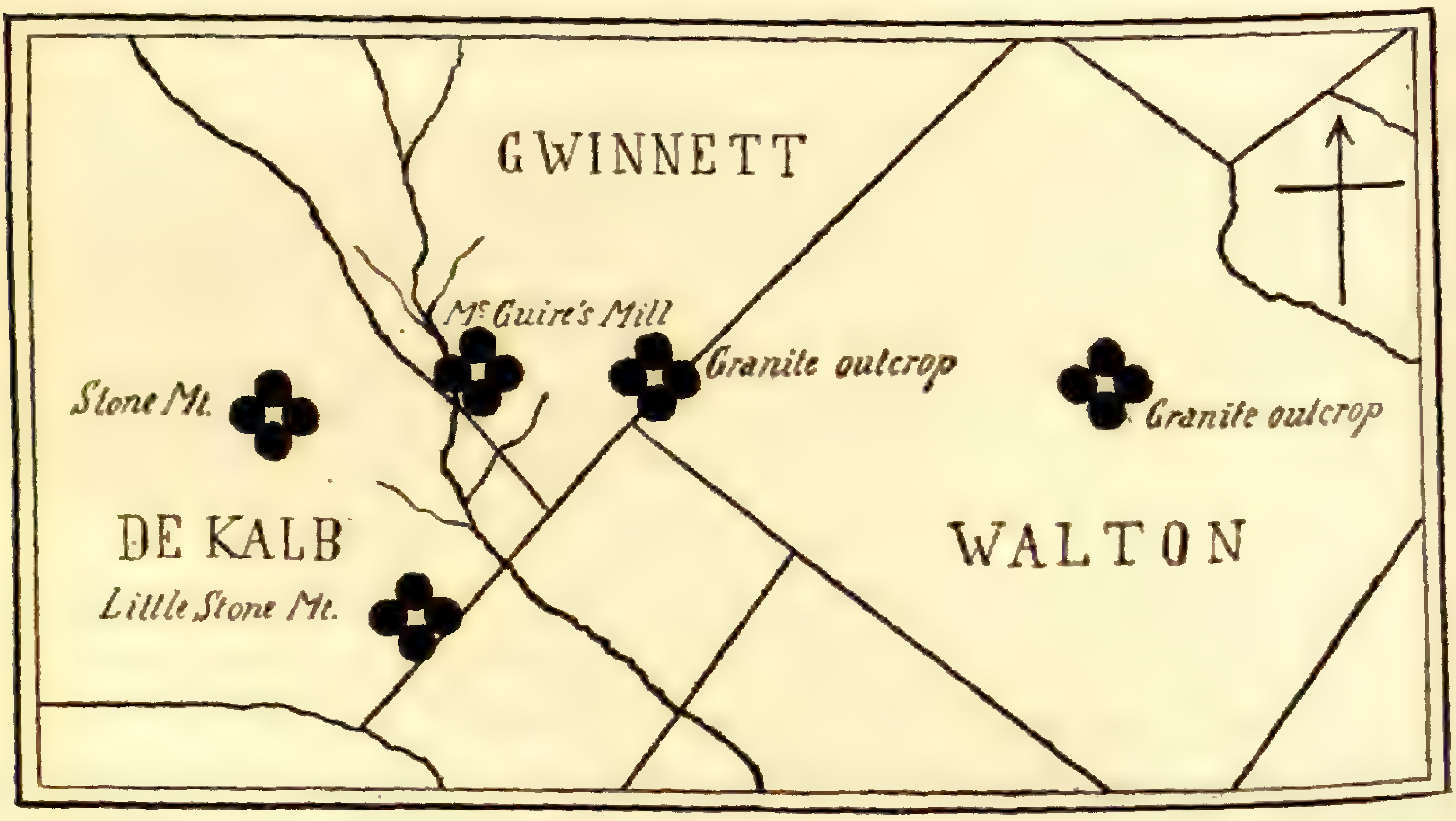
A species of southern distribution separable from *Sieglingia seslerioides* by its more slender and wiry habit, the very slender and diverging branches of the panicle and the usually conspicuous tufts of viscid hairs at the nodes throughout the panicle.

I found it last season growing in sand on the slopes of Currahee Mountain, near Toccoa, Georgia, and along the Yellow River, Gwinnett County, in the same State. Its range may be given as follows: Georgia, as just cited, to Texas: J. Reverchon; Bigelow, Camp No. 4, between Ft. Smith and the Rio Grande, south to Florida: Chapman, Curtiss (3454) Duval County.

Quercus Georgiana M. A. Curtis; Chapm. Fl. S. States, 422 (1860). Although heretofore supposed to be confined to a single station and to exist only in shrub form, *Q. Georgiana* is now known to have a considerable range and also to reach a development which allows it to be classed as a tree.

Stone Mountain, Georgia, is the original locality of this species. There it is more plentiful than at any of the new stations, but seldom attains the form of a tree. During the last two years I have found this interesting oak at four new places, and at all of these it grows plentifully and the tree form predominates instead of the shrub.

Along the Yellow River, about six or seven miles east of Stone Mountain, there are several large groves on the sides of the cañons where the granite rocks outcrop. Six or seven miles east of the Yellow River there occurs another outcrop of granite, and here two fine trees stand and bear fruit in great abundance. Travelling between the last mentioned station and the Oconee Mountain, a little to the south of east, I came upon another granite outcrop just west of the Oconee River. There the species again appears, and it is interesting to note that whenever found it is confined to granite outcrops. A fifth, or fourth, new locality is Little Stone Mountain, situated about nine miles south of Stone Mountain. There the species reaches its greatest development in size, measurements showing a height varying from twenty to thirty feet and a maximum trunk diameter of fourteen inches. The following map will give an idea of the geographic distribution of this oak.



Phoradendron flavescens (Pursh) Nutt.; A. Gray, Man. Ed. 2, 383. 1856.

This plant is quite plentiful in the vicinity of Stone Mountain, Georgia. At all the places where I found it in that region its host was *Quercus Georgiana*, although there were numerous other deciduous-leaved trees growing with the latter species.

✓RUMEX FASCICULARIS n. sp.

Perennial by a cluster of fusiform tuberous roots, glabrous, of a dull, rather dark or olive-green color. Roots in clusters of from 3–5, 5–10 cm. long; stem lax and weak, 5–6 dm. long, decumbent and ascending, strongly grooved, abruptly thickened at the base and slightly thickened at the nodes; internodes 1–6 cm. long; leaves mostly oblong, occasionally a few oblong-ovate or ovate, 7–17 cm. long, 4–7 cm. broad, of much the same size throughout and clustered at the shortened end of the stem near the inflorescence, acute or obtuse, somewhat undulate and crisped, mostly truncate or cordate at the base, sometimes obtuse, thick (drying very thin), petioled; petioles stout, 3–7 cm. long, strongly dilated at their bases; ocreae thin and brittle, fugacious; panicle 12–16 cm. long, rather dense in fruit; racemes ascending, 1–5 cm. long; pedicels slender, narrowly clavate, winged at the summit, deflexed in fruit, 1–2 cm. long, articulated at the base; wings of the calyx broadly deltoid, 4 mm. long, 5 mm. broad, undulate, strongly nerved, each bearing an ovoid rugose callosity: style-segments reflexed on the angles of the achene; achene broadly pyramidal-ovoid, triquetrous, 2 mm. long, chestnut-colored, smooth and shining, the faces concave, the angles slightly margined. Plate 246.

A peculiar and striking species on account of its clustered leaves. The shape of the latter is different from that of any other North American member of the genus. By its inflorescence, wings and achene it is related to *R. Floridanus* and *R. verticillatus*, but the achene is broader and shorter than that of either of those two species. The stem is unable to support the weight of the leaves and inflorescence and bends over, endeavoring to rise again at the end.

The specimens were collected by Mr. Geo. V. Nash, on his recent excursion to Florida, in cypress swamps, on the marshy shore of Lake Harris, near Eldorado, in the central part of the peninsula.

✓ACER LEUCODERME n. sp.

Acer Floridanum acuminatum Trel.

A shrub, or small tree reaching a height of eight meters and a trunk diameter of from one to five dm., clothed with a smooth white bark. Trunk very short, sometimes almost wanting; branches (secondary trunks), two to eight together, erect or ascending, conspicuous by their white bark; branchlets clothed with a gray or reddish bark; leaves depressed-orbicular (*i. e.*, broader than high), or rarely orbicular in outline, mostly three-lobed, sometimes imperfectly five-lobed, 4–9 cm. in diameter, cordate or truncate, petioled, with a rather open and shallow sinus, dark green, glabrous and marked with light nerves above, greenish, tinged with red, prominently nerved and very velvety (to the touch) beneath, the lobes acute or acuminate (the 4th or 5th when present obtuse), each (or the terminal one only) bearing two obtuse teeth; petiole slender, reddish, 3–6 cm. long; flowers not seen; wings of the samaras oblong-spatulate, 1–2 cm. long, red, conspicuous, parallel or nearly so (more or less spreading when the fruits separate at maturity); seed oblong, its covering prominently veined.

A very handsome maple, characteristic on account of its habit of branching near the base into from several to many secondary trunks, and the white bark. The bright green color of its foliage and the usually bright red fruit render it conspicuous, and while the velvety pubescence on the lower surfaces of the leaves is not prominent it is remarkably soft and dense to the touch.

As far as I have observed, the tree is confined to the bottoms of two rocky cañons, that of the Yadkin River, in Stanley county, North Carolina, and especially that of the Yellow River, in Guinnett county, Georgia. Dr. Trelease has reported the tree from further south, where it doubtless occurs, but I do not know the character of the localities.

Koellia verticillata (Michx.) Kuntze, Rev. Gen. Pl. 520. 1891.

Pycnanthemum Torreyi Benth. Lab. Gen. & Sp. 329. 1834.

This species of Koellia has never been recorded as growing further south than Southwestern Virginia,* and consequently it has not been credited to the Southern Flora. In August, 1893, I found the plant growing in Northern Georgia, in Rabun county, near Estotoah Falls. It was quite plentiful in the valleys and ravines, at about 2000 feet altitude and inhabited localities much like those in which it was found in Southwestern Virginia.

✓Solidago Yadkinensis (Porter).

Solidago Boottii var. *Yadkinensis* Porter, Bull. Torr. Club. 1892.

Perennial, slender, wand-like, glabrous and of an olive-green color throughout. Rootstock long, chaffy, horizontal; stem 5–15 dm. long, erect, simple below the inflorescence; basal leaves tufted, lanceolate or linear-lanceolete, the blade 10–30 cm. long, acute at the apex, acuminate at the base, the petiole 6–15 cm. long, winged; cauline leaves lanceolate, linear-lanceolate or linear-oblong, 3–15 cm. long, erect and appressed, acute at the apex, sessile, the lower ones like the basal, serrate with a few distant appressed or spreading teeth; inflorescence consisting of a simple terminal secund raceme or thyrse; heads campanulate, stalked, 3–4 mm. high, 25–35 flowered; involucral bracts in four to five series, oblong or linear-oblong, 1–2 mm. long, ciliate, obtuse, with a dark-green midrib and tip; corolla slightly longer than the pappus, more or less pubescent; rays yellow, oblong-spatulate, entire, 2–3-apiculate; achene columnar, obtuse at the base, 10–14-ribbed, pubescent with a few spreading hairs.

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* Mem. Torr. Club, 4: 146.

This species was first described as a variety of *Solidago Boottii* by Prof. Porter, from collections made by Mr. Heller and myself in middle North Carolina in 1891. On first meeting with the plant it seemed to me a good species, and field observations on it each succeeding season have convinced me of its specific validity. It grows only in rather open meadows scattered through the pine woods. The first specimens seen were of the simple type (*i. e.*, in which the inflorescence consisted of a simple terminal raceme) and not over six dm. tall. They were found near Gold Hill, N. C. Last season I found this type near the base of Dunn's Mountain, in the vicinity of Salisbury, N. C. However, a more robust and branched form is the more common state, and this occurs at many localities in middle North Carolina. Up to last season *Solidago Yadkinensis* was not known to grow outside the last mentioned region, but in September (1894) I met the plant growing luxuriently at two stations in middle Georgia; the one a botanically prolific meadow near Loganville, Walton county, and the other meadows near the base of Little Stone Mountain, DeKalb county. The Georgia specimens are a little more robust than those from North Carolina, but otherwise they are almost identical. The variation that does exist is due to the less exposed conditions under which the Georgia plants grew.

Botanical Notes.

Tumble mustard. A species of mustard that promises to be one of the most formidable tumbleweeds yet introduced in the United States has been found by Mr. J. H. Sandberg and Mr. J. M. Holzinger, well established as a roadside weed in the side streets of Minneapolis. It is *Sisymbrium altissimum* L. This species was collected on ballast ground at Philadelphia in 1878, and in 1885 it was found near Castle Mountain on the western boundary of Alberta. During the past five years it has become a troublesome weed in the vicinity of Indian Head, Assiniboia. It is there known by the very appropriate name of "tumble mustard." It has also been found at Ottawa, Canada.

The tumble mustard may be distinguished from the other mustards by its slender siliques, 3 to 5 inches long, and by its characteristic tumbleweed habit, making a rather dense bush-like plant at maturity. If discovered elsewhere than in the five places mentioned, the undersigned will be grateful for reports of the localities. In case of doubt as to determination franks will be sent for mailing and the specimens will be determined at the National Herbarium. LYSTER H. DEWEY.

WASHINGTON, D. C., August 14, 1895.

Reviews.

A Manual for the Study of Insects. John Henry Comstock and Anna Botsford Comstock. 8vo., pp. 701. Ithaca, N. Y. Comstock Publishing Company. 1895.

The entomological sky has become much cleared, so far as the student or beginner is concerned, by the publication of this *Manual for the Study of Insects.* There should be no difficulty now in determining in nearly every case the native insects as far down the scale of classification as the families to which they scientifically belong. This is made possible by numerous figures and tables of classification for each order, coupled with a general clearness of statement that does not bristle with an array of scientific terms. The book is essentially about insects and not their describers, for no authorities are given. This matter is no doubt left to the check lists and other more special works.

The first chapter deals with classification and nomenclature; the second with crabs, spiders, centipedes and other near relatives of the true insects, and the remaining nineteen with the six legged insects or Hexapoda, each chapter being devoted to a separate order. This number of orders, as Prof. Comstock says, slightly exceeds that commonly adopted. The difference, as will be seen by the reader, results from dividing the Platyptera of recent classifications into four separate orders. Those adopted in the work are the following:

THYSANURA	Bristle-tails, Spring-tails.
EPHEMERIDA	May-flies.
ODONATA	Dragon-flies.
PLECOPTERA	Stone-flies.
ISOPTERA	White-ants.
CORRODENTIA	Procids and Book-lice.
MALLOPHAGA	Bird-lice.
EUPLEXOPTERA	Earwigs.
ORTHOPTERA	Cockroaches, Crickets, Grasshoppers, etc.
PHYSOPODA	Thrips.
HEMIPTERA	Bugs, Lice, Alphids and others.
NEUROPTERA	Aphis-licris, Ant-licris and others.
MECOPTERA	Scorpion-flies, etc.
TRICHOPTERA	Caddice-flies.
LEPIDOPTERA	Moths and Butterflies.
DIPTERA	Flies.
SIPHONAPTERA	Fleas.
COLEOPTERA	Beetles.
HYMENOPTERA	Bees, Wasps, Ants and others.

It is not supposed that this sequence is altogether a natural one, but the best that can be expressed in a linear series, and indeed, it does not make any difference whether, for instance, the Lepidoptera immediately precede or follow the Diptera.

The greatest space is given to the chapter on Lepidoptera, which occupies 222 pages, and it is chiefly in this much collected order that changes of classification are noticed. They are based upon the venation of the wings; the character of the antennæ, vestiture, etc., not holding so prominent a position as in other systems. This classification seems to be very good so far as clearness is concerned, and is easily comprehended by the general reader, but perhaps specialists will not take to it so kindly.

In the chapter on Coleoptera the tiger beetles are mentioned first and the *Scolytidae* last. In some recent classifications running from the lowest to the highest this system is reversed.

The book is finely illustrated, containing 797 figures and six plates, the frontispiece (Plate I.) being colored. On page 154 is a picture of four grotesque leaf-hoppers sitting in a row on a grass blade, who rival in absurdity of expression the famous Brownies. Some of the illustrations include the plants on which the insects feed, and the food plants are also often mentioned in the text. Entomology as a rule does not form a conspicuous part in books on botany, but the botany of an entomology is a more important matter, many of the insects taking their names from the plants upon which they feed. The illustrations of the wing-veins are particularly numerous, and it is these, and the tables for determining the families and higher groups, that contribute largely to the clearness of the book. W. T. Davis.

Studies in Plant Development. Henry L. Clark. Chicago. 1895.

One is at a loss to know just what to say on examining this outline of plant analysis, for such it is, neither more nor less. Judging from its mechanical construction and arrangement one would conclude that it was intended to serve as an aid in teaching young children the first principles of systematic arrangement, but the terminology, which is that of Vines (see his recent text-book on botany), will at once condemn it for such a purpose. The terminology used would lead one to suppose that it was intended for the use of advanced students and specialists in botany. Any one sufficiently advanced to comprehend the meaning and application of such terms as *gametophyte*, *apogamy*, *germ-plasm*, *body-plasm*, *microspore*, *macrospore*, etc., etc., certainly does not require an outline in the study of plant types. It is detrimental to teach students that such outline-study is botany. It is true, the author recommends a "constant use" of Vines' Text Book of Botany in connection with this outline work, which is good as far as it goes. It is, however, wholly wrong to teach students that they can become systematists without having first studied morphology and physiology. This prevailing idea has already done an inestimable amount of harm to the advance of botany. No student "may quickly be taught the small amount of technique (of the compound microscope) necessary to do outline work." It requires years of patient toil to learn how to use the compound microscope. *Any* person can look down the tube of a compound microscope, but whether said person knows and comprehends what he sees, or whether he sees anything at all, is another question. My advice is that the student should lay aside the "Studies in Plant Development" until he has mastered the rudiments of plant morphology and physiology by years of patient work in some well equipped laboratory and by consulting not only Vines but all other standard authorities on plant physiology and morphology. After this is accomplished the "Studies" may be permanently stored away in the garret along with other similar analyses.

As far as the make-up of the "Studies" is concerned it lacks nothing. Binding, paper and print are excellent. There is space for the "study" of fifty types. A short list of modern (Vines) botanical terms with etymology and meaning is added. In his classification we are pleased to note that lichens are recognized as a distinct class. It may be that the "Studies" could be made use of by advanced students in our universities, provided it was thought advisable to take the time for making the records. Of what use these records might be afterwards is more than we can understand at present because there are already printed records of all the known plant species.

It is with regret that we make this adverse criticism, but we firmly believe that any mistaken tendency should be checked early. The mistaken idea of what constitutes plant study has already gained such a strong footing that we must put forth every effort to check its progress. Let us sincerely hope that pernicious "plant analyzing" may never be substituted for *Botany* in our higher institutions of learning. Let us hope that in the future the author will expend his time and talent on some work which will prove a real benefit to the advance of botanical science.

ALBERT SCHNEIDER.

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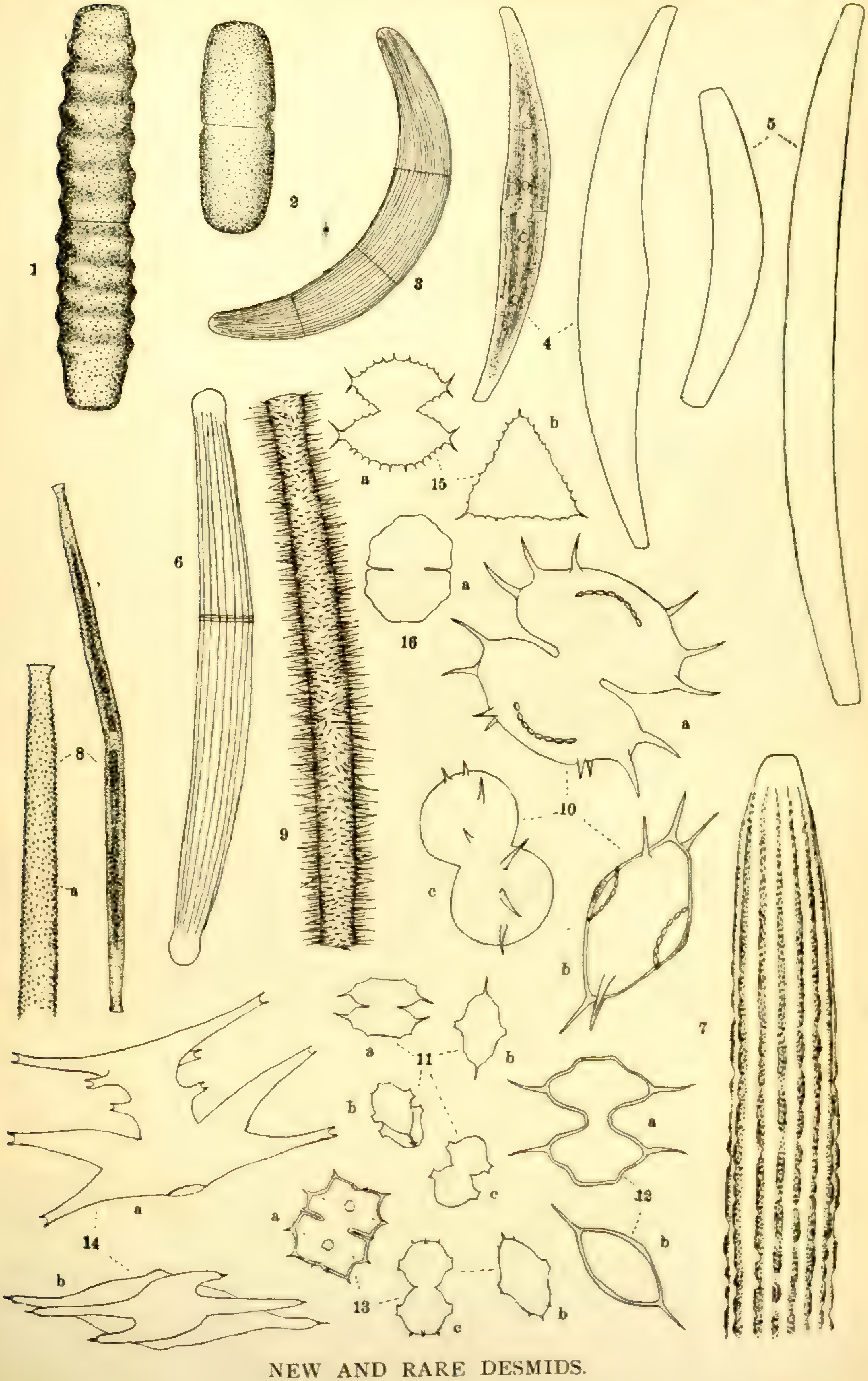
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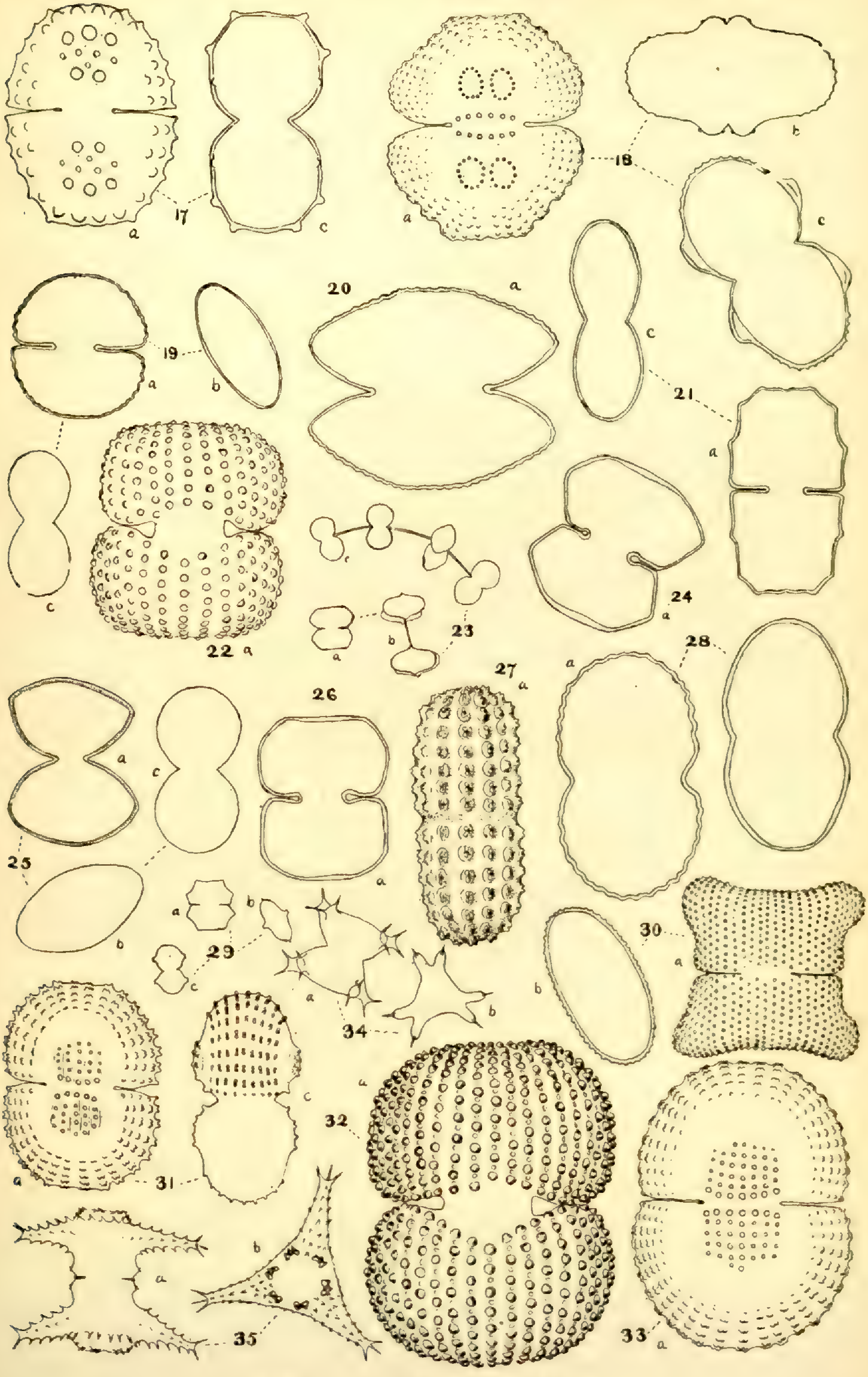
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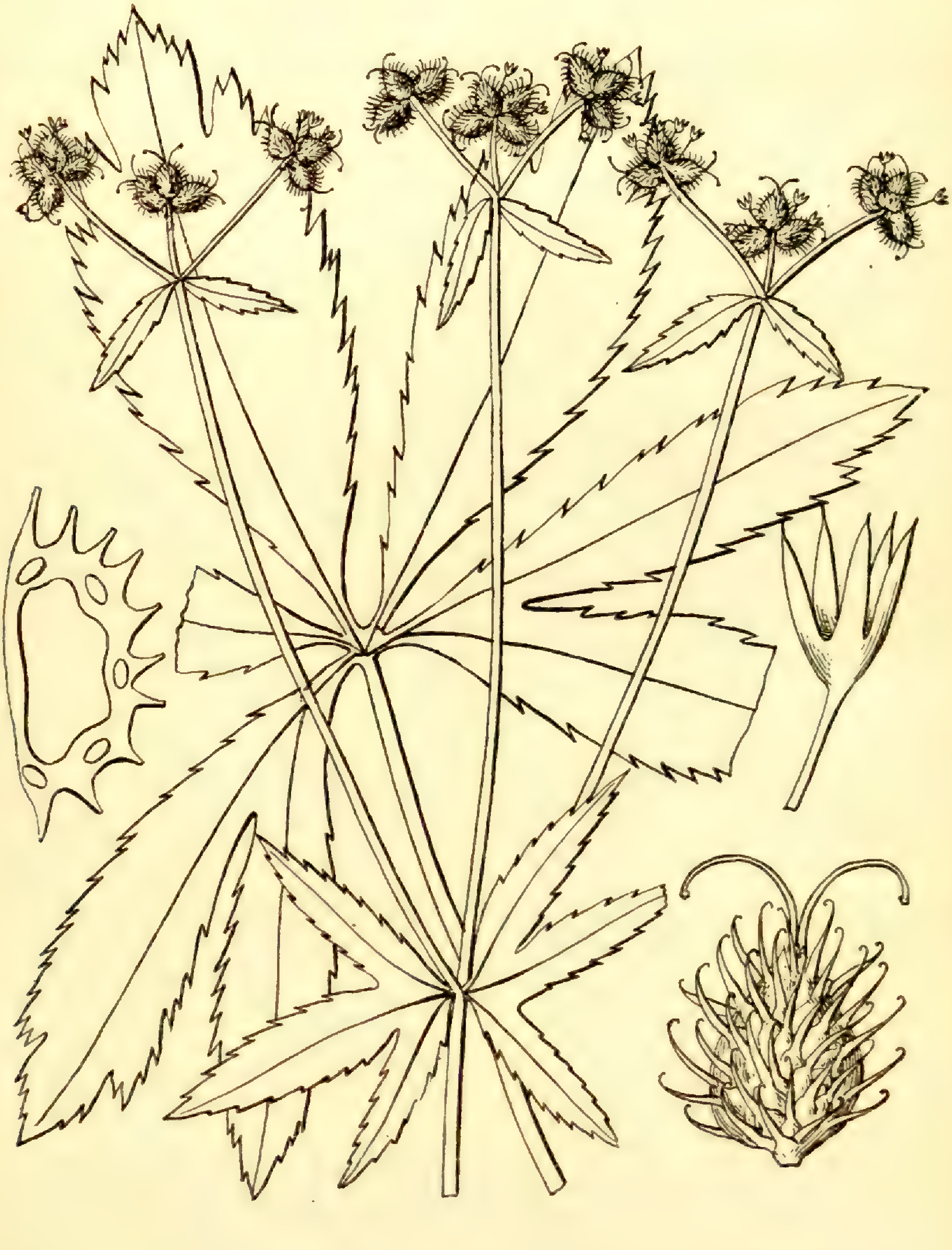

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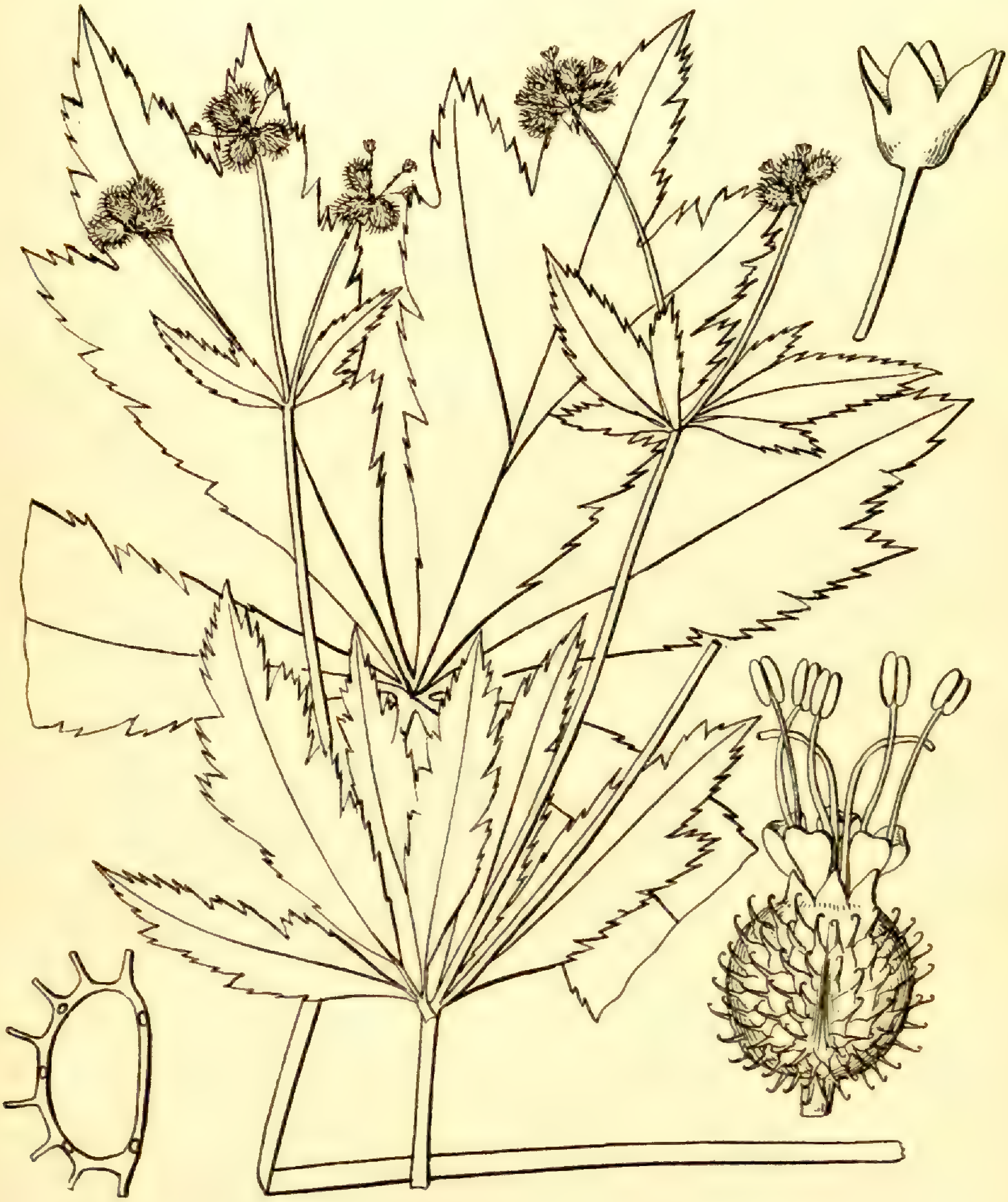

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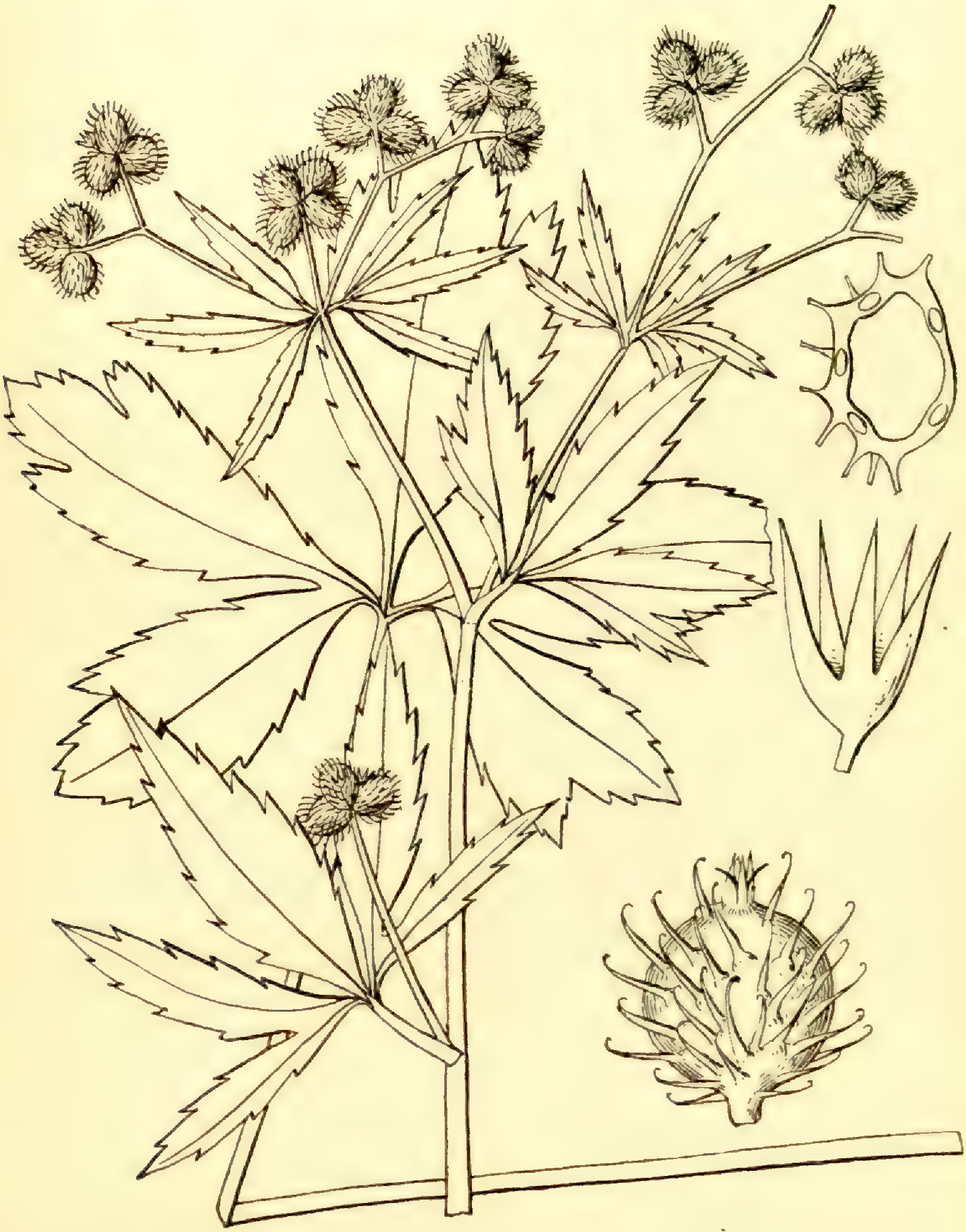

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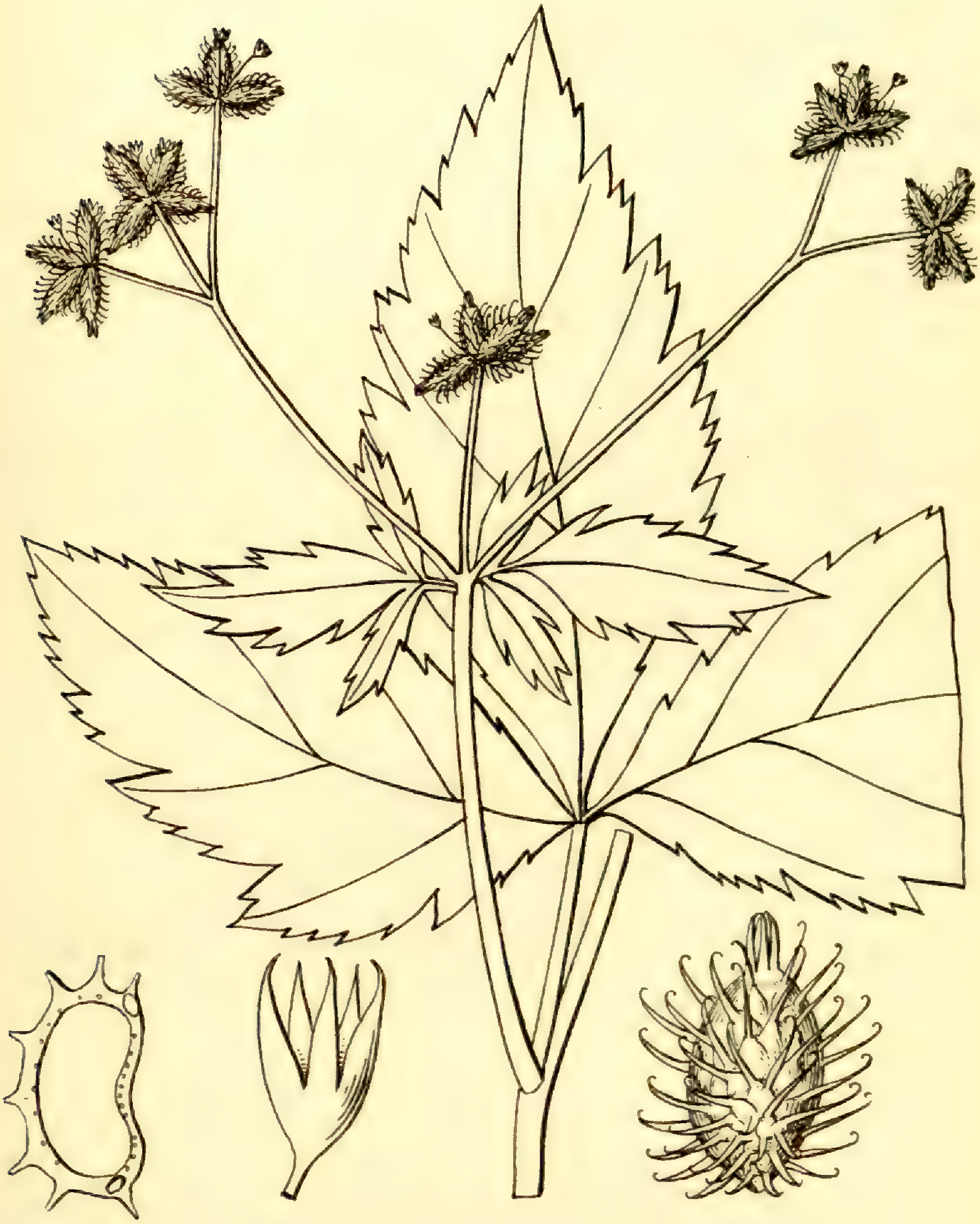

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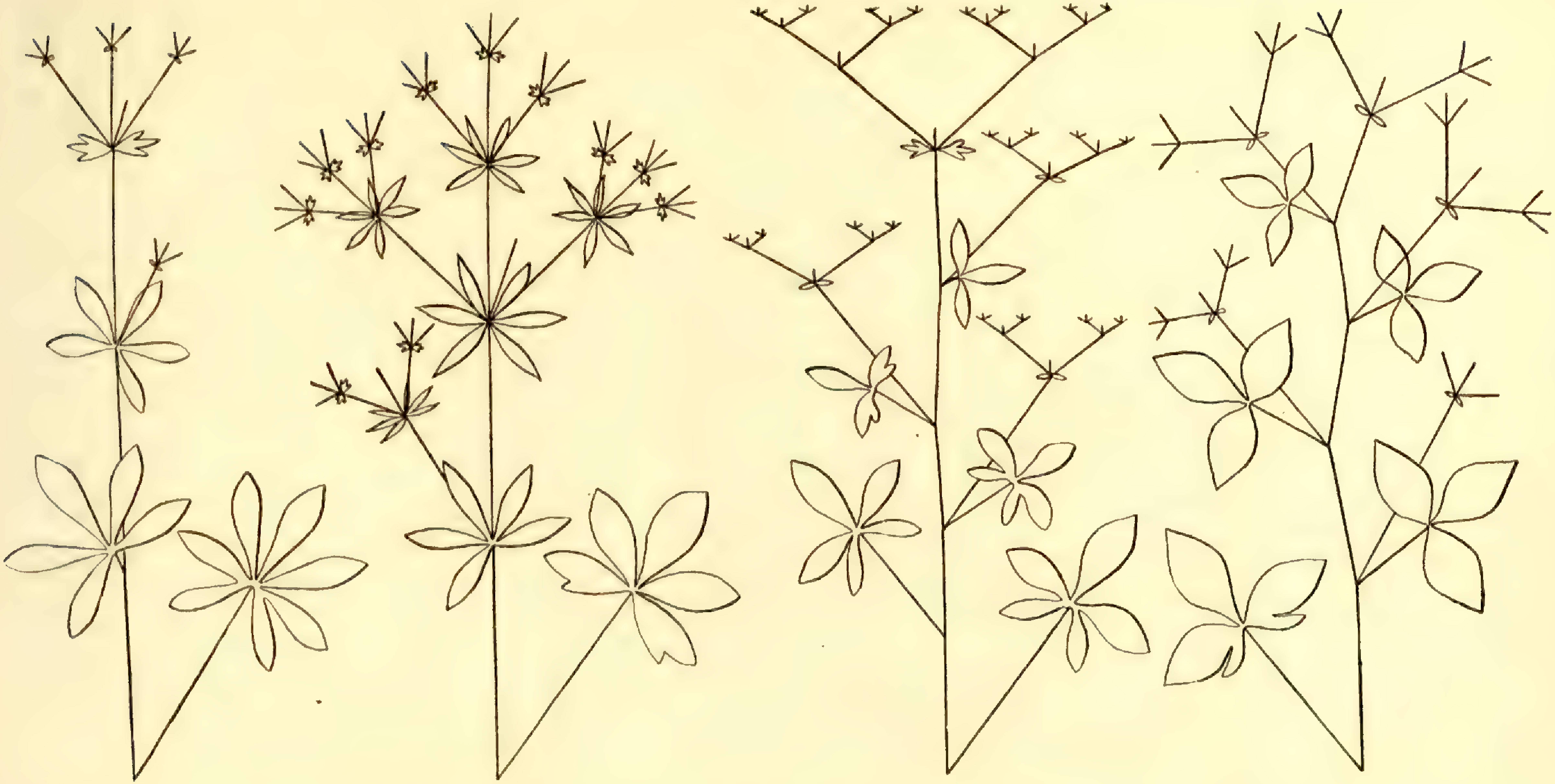

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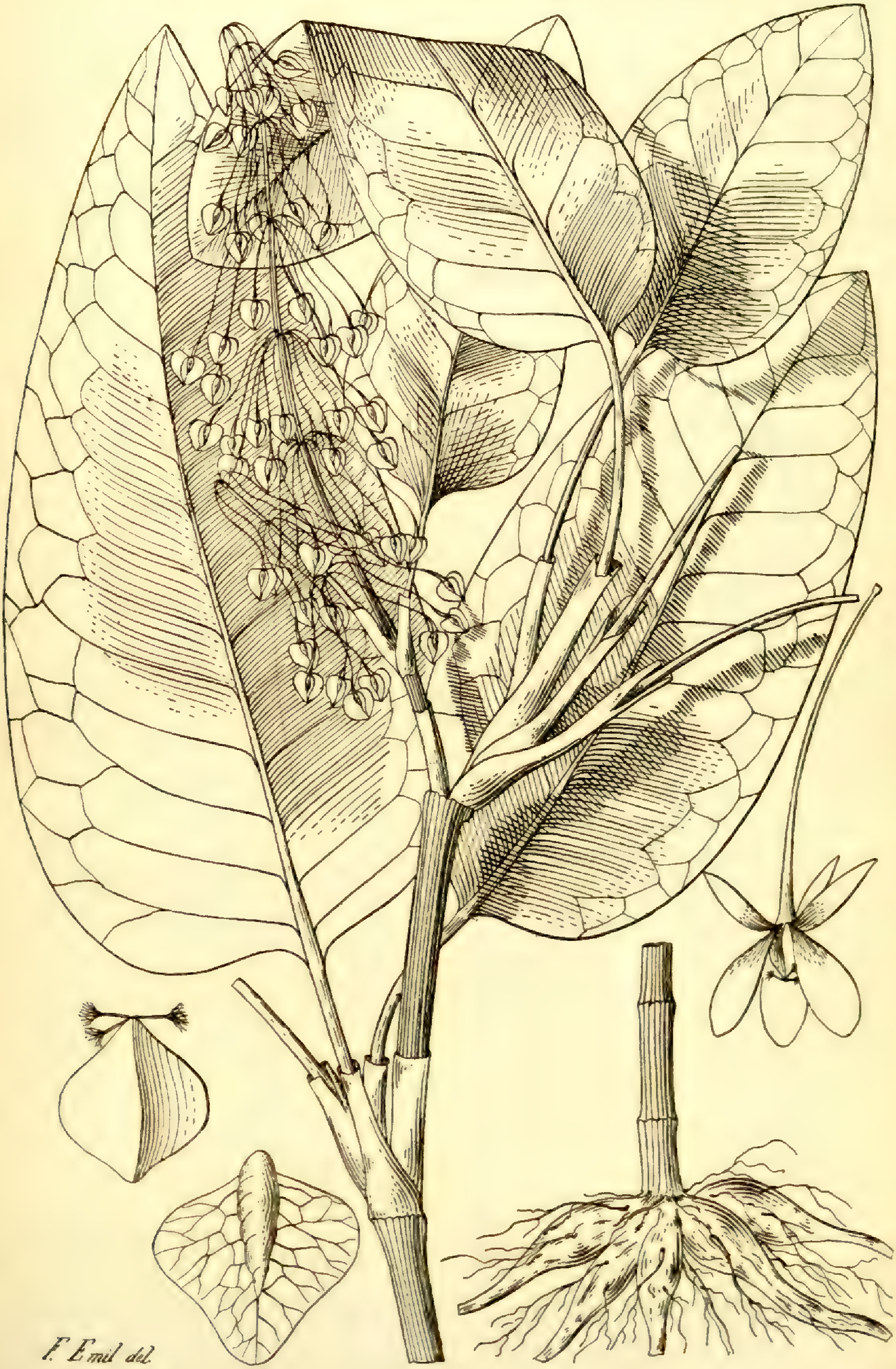

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OF THE

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Vol. 22. Lancaster, Pa., September 30, 1895. No. 9.

Antidromy of Plants.*

By George Macloskie.

During the summer of 1893 I made observations on Indian corn, which were published in abstract in the Princeton College Bulletin of November, 1893. It was then shown that, if we judge from the modes of overlapping of the leaf margins of Maize and of other Gramineae, there must be two kinds of plants of every species of the order; the one kind or "caste" has its lowest foliage leaf (the leaf next above the pileolus in the embryo) with the right margin of its sheath overlapping the left margin, "dextrally infolded" as I term it; and the other caste has the left margin overlapping the right, "sinistrally infolded." The leaves at subsequent nodes are alternately sinistral and dextral. In order to ascertain the origin of this duplicity I read Van Tieghem's researches on the Cotyledons of the Gramineae (Ann. des Sci. Naturelles, 1872), which stated that the leaves of the plumule within the seed are alternately enfolded on each other, but failed to indicate the direction of the enfolding of the first leaf.† The dissection of one or two seeds revealed a dextral initial folding; and soon other grains were found with sinistral folding. Thus it became manifest that as there are two castes of maize-plant, so there are two castes of grains, the one being the "anidrom" of the other, the leaf-folding starting diversely, and the leaves of successive nodes, running contrariwise in the plumule of one grain as compared with that of another grain.

---

*Read before Section G., A. A. A. S., Springfield meeting, September, 1895.

†He states that the direction of the evolution of the leaves is determinate, but there is variation as to the first green leaf, and he had not been able to discover its cause.

The next problem was to orientate the grains of each caste in the ear of Maize. The ear consists of columns each containing a pair of rows of grains; we may designate the row opposite our right hand dextral and the other row (opposite our left) as sinistral. It was soon made out that in the particular ear examined, the grains of the dextral row were all with dextral embryos, and those of the sinistral row had sinistral embryos. Whether this law would apply to all the ears on one plant, or whether the order would be inverted between the ears arising from successive nodes, or between the ears of different plants, is yet to be determined. On examining the very young ear of maize I found the grains of the paired rows of each column orientated close to each other, almost face to face, the young styles running up together, and a gap between the adjoining two-rowed columns.

From this discovery the inference was obvious that the seeds of corn differ from each other antidromically, according to the side of the placenta or axis from which they arise; that their embryos vary in consequenee, and determine the caste of the future plant. Whilst it was easy to see that the same rule will include all the Gramineae, I hazarded the suggestion that it may be found in some measure to dominate other orders of plants. The discovery as to the corn .disposes of Sachs's crowning argument against phyllotaxy, which he supposed could have no significancy as to Gramineae, on account of their distichous leaves.

Early in August, 1895, I was struck by the graceful inflorescence of Ladies' Tresses (*Spiranthes praecox* Watson, *S. graminea* var. *Walteri* Gray). Its spiral rows of pure white flowers are antidromic as between different individual plants; about half the specimens have dextral spirals (viz., turning in the direction of the thread of a common screw), and the same number have sinistral spirals. Another interesting point was that the phyllotaxy, or arrangement of the distichous leaves in a primitive spiral, of each of the plants of *Spiranthes* follows the order of the inflorescence, dextrorse phyllotaxy invariably accompanying the dextrorse anthotaxy, and conversely.* The numerous seeds of these plants are too small to be easily compared together; but the phyllotaxy or even the inflorescence serves as our best guide when other indications fail. A similar remark will apply to *Oenothera biennis*, whose inflorescence curves to the right or left in the same direction as the leaves; though not always so easily determined as in Ladies' Tresses. In some cases the seeds form a ready guide. For example, the Lima-bean is found on examination to have its cotyledons right and left, and two foliage leaves respectively dorsal and ventral (towards the dorsal and ventral sutures of the pod). Now I found that the right margin of the dorsal leaf of the plumule of one seed overlaps the right margin of the ventral leaf, but the left margin of the dorsal leaf is overlapped by the left margin of the ventral leaf; and in another seed these relations are reversed. I also found that the seeds growing on one valve of the pod, being Nos. 1, 3, 5, were all similar; whilst the seeds on the other valve, being Nos. 2, 4, were reversed. Thus the seeds on one margin of a carpel are found to be antidromically related to those on the opposite margin. (I have not examined whether successive pods from the same plant reverse these characters or not.) The pea showed its antidromy best when germinating, the emerging plumules of different seeds appearing under careful orientation to come up with opposing twists. The large plumule of the Almond seed can be seen by dissection to have two modes of torsion in different seeds. The akenes of *Caffea* exhibit antidromy, an interesting point in this plant as the opposite leaves render the determination otherwise difficult. The deeply enfolded endosperm of the coffee-bean is seen on a cross-section of different seeds to be in opposite directions; a mark which is a sure indication of similar diversity in the minute embryo. Even from the outside the two kinds of akenes are easily distinguishable, the figure of one reversing that of the other like one's right and left hand, thus proving that the two mericarps are relatively antidromic; and confirming the evidence already derived from the corn and Lima-bean, as to the origin of this character.

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* Dextral phyllotaxy has the primary spiral traced by the insertion of the leaves directed like the thread of a common screw. With leaves overlapping at the margins, dextral overlapping may produce sinistral phyllotaxy.

The case of *Banksia* of Proteaceae further illustrates the subject. Judging from the figure in Engler and Prantl's Pflanzenfamilien, (3 : part 1, 152) it has a pair of flowers, situated back to back, with bractlets, stamens, ovary and seeds, all antidromic; in this case the diversity of the seeds seems to be anticipated by the structure of the flower. The flowers on the same branch of *Althaea* have their petals twisted in contrary directions.

In connection with the explanation of antidromy as depending on the origin of seeds along the margins of a bilateral organ, it would be interesting to examine the few cases in which seeds are represented as terminal on the floral axis, a view which may be confirmed or refuted by this law. It is likewise interesting to note that in specimens of *Bryophyllum calycinum* (kindly furnished me by Prof. S. T. Maynard, of Amherst Agricultural College), I was able in this opposite-leaved flower to make out the marginal buds on the leaves to be antidromous. The Calla lily (*Richardia*) has both the alabaster spathe and the arrangement of the akenes on the spadix antidromic as between plants which grow from the same rootstock. The Iris also when growing by bifurcation of the rootstalk gives antidromic plants; how they are when propagated by lateral branching I cannot say. Rushes growing together in clumps are antidromic as between the individuals united at the base of the rootstalk (I do not find it so in *Carex* or grasses growing in tufts; all of the same tuft seem to me to be homodromic, but this subject requires more careful examination than I have made).

Phyllotaxy is a particular outcome of antidromy, and in very many cases is the readiest evidence of the antidromic organization of the plant. But whilst antidromy is a primitive character, influencing the general morphology of the plant, yet each part of the evidence, and most frequently the order of the leaves, the inflorescence and the perianth, may be modified by secondary changes, which send us back to the mother-seed and its germination as the only remaining proof of the primitive character. Twining of stems, contortion of perianth, accumulations of flowers in complex ramifications, leaves becoming opposite, or being spread out to the sunlight, and even difficulties of orientation of seeds disguise the truth and explain why it has so long remained a secret. The distortions of phyllotaxy misled the early students on the subject, so as to nearly banish the term and the theme from botanical science. Old books spoke vaguely of some plants being *homodromous* and others *heterodromous*, without attempting to find any law to explain these apparent irregularities. We now see its significancy and find its anomalies all reduced to order, and we must welcome it back to its rightful place. So far as I have been able to find, all plants are homodromic within the individual, and heterodromic as between different individuals of the same species. Apparent exceptions to these rules are no more than apparent, and if anybody will set himself to look up the evidence, it will soon be so overwhelming, and nothing against it, as to render his work monotonous. Go into the nearest orchard and you will find two kinds of every species of fruit tree, two kinds of every shrub, two kinds of common flowers, having the primary spirals of the leaf-insertions dextral in one set and sinistral in the other set. In case of plants with opposite leaves this evidence will fail you, for you can make out two crossing primary spirals in the same branch; in other cases you are baffled by the leaves assuming new positions for the sake of the light, though sometimes even in these plants you may find the primitive traits in branches not exposed to the sunlight.

With a few weeks' observation I have found double phyllotaxy, as a mark of antidromy in the following plants representing the more important orders of Phaenogams: *Delphinium* (Ranunculaceae), *Liriodendron* (Magnoliaceae), *Bocconia* (Papaveraceae), mustard (Cruciferae), *Abutilon* and *Hibiscus* (Malvaceae), *Pelargonium* and *Impatiens* (Geraniaceae), bean and pea (Leguminosae), apple, pear, peach (Rosaceae), *Oenothera* (Onagraceae), carrot (Umbelliferae), sunflower and other Compositae, *Lobelia* (Lobelieae), *Myosotis* (Borraginaceae), *Verbascum* (Scrophulariaceae), tobacco (Solanaceae), *Polygonum* (Polygonaceae), *Ricinus* (Euphorbiaceae), *Salix* (Saliaceae), *Quercus* (Cupuliferae), and among monocotyledons, lily (Liliaceae), *Musa*, Ladies' Tresses (Orchidaceae), species of Aroideae, Iridaceae, Juncaceae, Cyperaceae, Gramineae. To the above we have to add from the perianth and arrangement of stamens Nymphaeaceae; and by the courtesy of Mr. Everett H. Barney, of Springfield, Mass., I was furnished from the Forest Park Ponds with seeds of *Nelumbium* which on being opened, showed the embryos rich in chlorophyll, with their leaves in one seed folded round in the inverse order of those in another seed; besides this the insertion of the stamens in the flower of different individuals of *Nelumbium* form antidromic spirals. A special case among the Liliaceae is *Convallaria majalis*, whose two leaves are at the usual angle among the Monocotyledones of 120°, and as one of the leaves forms a sheath around the other, it is instructive to observe how in a bed of Lily-of-the-Valley, all the plants being regarded under the same orientation, the inner leaf in half the plants bends over 120° to the right, and in the other half to the left. Arthur K. Harrison of Lebanon Springs, N. Y., informs me that before he heard of my work he had taken note of the double phyllotaxy of *Veratrum viride*.

With a little care we can make out the general law as applying to the Gymnosperms; both the phyllotaxy and the spirals of the cones of Coniferae show it; and it may be expected to manifest its presence in the relative position of the cotyledon, during germination; also in the embryo and its suspensor in *Cycas*. (See figures in Engler & Prantl, **2**: 1. 17.)

I have not yet tried the opposite-leaved orders, further than the case of *Caffea*, and that of *Bryophyllum*, as insufficiently tested by the marginal buds on the leaves; if this last observation be verified, it may reinforce the old doctrine that ovules are the homologues of such marginal buds. *Acer platanoides* shows it by the antidromic folding of the cotyledons of the seeds of adjoining carpels; also *Aesculus* by the contrary curvature of its radicles and by its plumules. Nor have I tried the twiners and climbers, saving that I have partially succeeded with Morning-glory (Convolvulaceae). Its embryo resembles that of some Cruciferae in having the radicle folded "incumbently" upon the cotyledons; and again (unlike the Cruciferae) its orientation is changed so that the radicle lies next the floral axis and the cotyledons lie towards the periphery. Now if we reduce the orientation back to that of Cruciferae, we shall find a very close correspondence of the embryonic structures in the two orders, and the same antidromic difference will be found in Convolvulaceae that is readily shown by the phyllotaxy of Cruciferae.

The embryo of *Lepidium Virginicum* has its cotyledons twisted so as to be erroneously described in the books as accumbent; something similar occurs in *Sisymbrium officinale*. In these cases the adjoining seeds have the embryos twisted in contrary directions, so that the apparent anomalies are explained as cases of pronounced antidromy. Whilst the pericarp of akenes follows the torsion of the enclosed seed, capsular pericarps seem to follow the phyllotaxy of the mother plant; thus the pods of mesquit (*Prosopis*) are similarly twisted in the same plant, as are those of *Medicago*, those of balsam (*Impatiens fulva* and *I. balsamina*) spring open with a right or left twist in harmony with the dextral or sinistral phyllotaxy of the bearing plant.

Amongst the peculiar cases that occurred was that of *Salix Babylonica*, of which only the female plants are known; and consequently there is no reproduction by seed, and we expected to find no antidromy. Specimens growing about Princeton appear to be sinistral in their phyllotaxy, and as tradition derives them from the tree growing by Napoleon's grave at St. Helena the inference arises that the St. Helena willow also was sinistral. This inference is confirmed by a young tree in Forest Park, at Springfield, which Mr. Barney knows to have come from St. Helena. But other specimens of the same species with dextral phyllotaxy are common. Thus we learn that whilst all representatives of the male line of this species have probably perished, there are at least two independent branches of the female line perpetuated by cuttings.

Another interesting case is that of *Canna*. The leaves of all the specimens which I have found at Northampton, Mass., and at Princeton, are when young spirally folded, right flap uppermost, and when expanded have a slightly dextral phyllotaxy. I am told that this is usually propagated from bulbs; but that it is sometimes grown from seeds; if this last statement be true we should expect individuals of both castes; but I have been unable to find any except the one caste (even a second variety bearing reddish leaves is by coincidence of the same cast as the common one). Doubtless the other caste occurs through the country.

The scape or flower-stalk of *Canna* may cast light on the structure of Gramineae. Whilst all the foliage leaves of the *Canna* (so far as I have seen it) are dextral, the flower-stalk is provided with a succession of sheathing bracts, the edges folding over each other in reversed order at every succeeding node. This is exactly as in Maize, being a special kind of phyllotaxy, which depends not on a primary spiral, but on a reciprocating overlapping of the margin of sheathing organs; also a double leaf between each branch and the mother-axis is present as described by Van Tieghem in Maize. Thus it appears that the whole corn-plant, culm, leaves and flowers is the counterpart of the flower-stalk of canna and of its bracts and flowers, but having no representative of its foliage-leaves. According to this view one part of the reduction of the Gramineae is the non-development of proper foliage leaves, and by way of compensation the excessive development of the bracts with a green lamina for assimilation. It is of special advantage to gregarious plants to have their assimilating organs lifted up to the air and sunshine. (No notice is taken of the peculiar alternancy of leaves of gramineae by Pax, Vines or the other recent writers on Morphology).

Among the results of this account may be mentioned the extension of unity of primitive structure thus shown to exist among all the Phaenogams; a unity that may yet be found to include some of the Cryptogams; also the relative simplicity of the Monocotyledones, which show few secondary distortions, though they are often reduced. A new problem of heredity is started, running differently through two sides of the carpel; yet each seed transmits both castes, one to appear forthwith in its immediate offspring, and the other to appear ultimately in a moiety of its successors. The objection that the discontinuity between carpel and ovule negatives the possibility of such transmission of characters is of no weight; the discontinuity is only apparent, for characters of secondary acquirement are carried across the gap, and *a fortiori* we may expect such a primitive law of organization as antidromy to be inherited. This law is also useful to suggest discovery. It suggested to me at the outset diversities between the stalks and inflorescence of Iris that had escaped Arnold Dodel in his study and illustration of *Iris Sibirica*, which was the work of some years; it has also opened problems about the significancy of opposite leaves, the real direction of leaf-traces in stem-structure (hitherto assumed to be entirely symmetrical) and other subjects bearing on vegetable anatomy, and the difficulties which brought discredit on phyllotaxy all vanish. Perhaps it may furnish a solution of the problem why wooden poles split in antidromic spirals, for which phenomenon some people have suggested the stress of wind on the living tree.

My work has been necessarily hurried; and I shall be glad if others will verify or amend it, and help to fill the many lacunae which I am compelled to leave unsupplied.

PRINCETON COLLEGE, Sept. 7, 1895.

Description of a new problematical Plant from the Lower Cretaceous of Arkansas.

BY F. H. KNOWLTON.

PALEOHILLIA ARKANSANA gen. et. sp. nov.

Stems hollow, .5–.75 cm. in diameter, several centimetres long, broken; wall two or three layers of cells thick; cells of epidermis of two kinds: 3–5 longitudinal rows of elongated, thin-walled cells that are two or three times longer than wide, alternating with broad bands of shorter and more irregular cells; stomata numerous, confined to the broad bands of irregular cells, arranged in three rows, two next to the rows of elongated cells with a row of distant ones between; stomata with apparently 4–6, usually 5, guardian cells.

The material upon which this description is based was collected by Prof. R. T. Hill, of the United States Geological Survey, during the season of 1888, while engaged under the auspices of the Arkansas Geological Survey in making a general investigation of the geology of southwestern Arkansas. It came from a gulch on one of the smaller branches of the Muddy Fork of Little River, about six miles northeast of Center Point, Howard county. The deposits containing these fossils were referred by Prof. Hill to the Trinity Division of the Lower Cretaceous. The beds are described as consisting of basal ferruginous sands, succeeded by firm white or yellow sand often filled with small concretions of iron pyrites, and mixed with clay. This clay is in sufficient quantity to bind the sandy material together "so that in drying it often becomes almost as hard as burnt brick." It was in this clayey material that these plant-stems were found.

The stems are very abundant and scattered in all directions through the mass. They appear to have been much rolled about and broken up, it being difficult to find a piece three centimetres in length. They were originally hollow, but most of them are now pressed perfectly flat, although an occasional one is found that was filled with clay when probably in a fresh state and consequently retains nearly its cylindrical form. When liberated by the crumbling of the sandy clay, the stems are very dark brown, almost black, in color and perfectly opaque. By boiling them for a few moments in dilute acid, a large part of the coloring matter was discharged and the cellular structure could then be made out.

Fig. 1

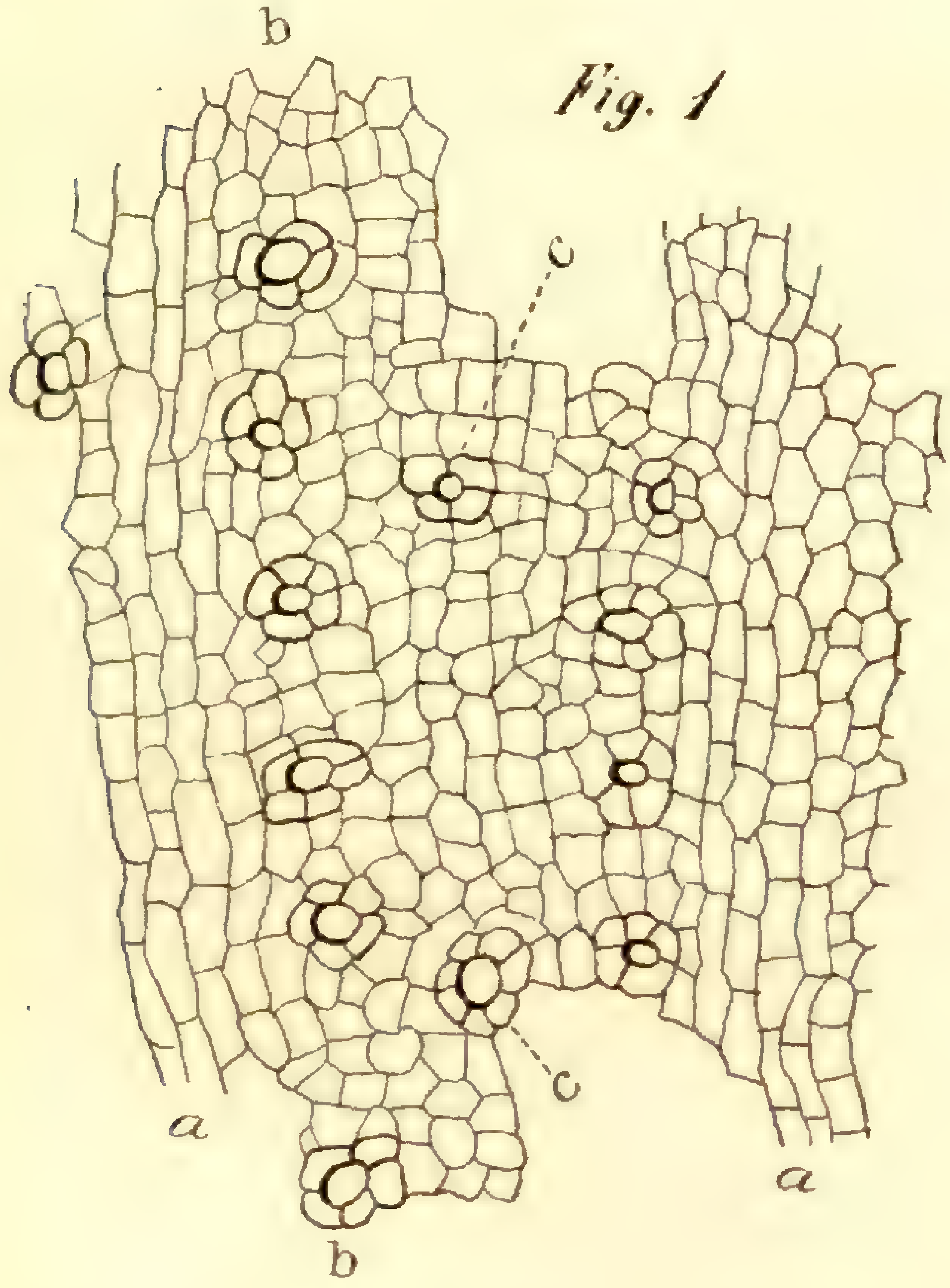

Fig. 2

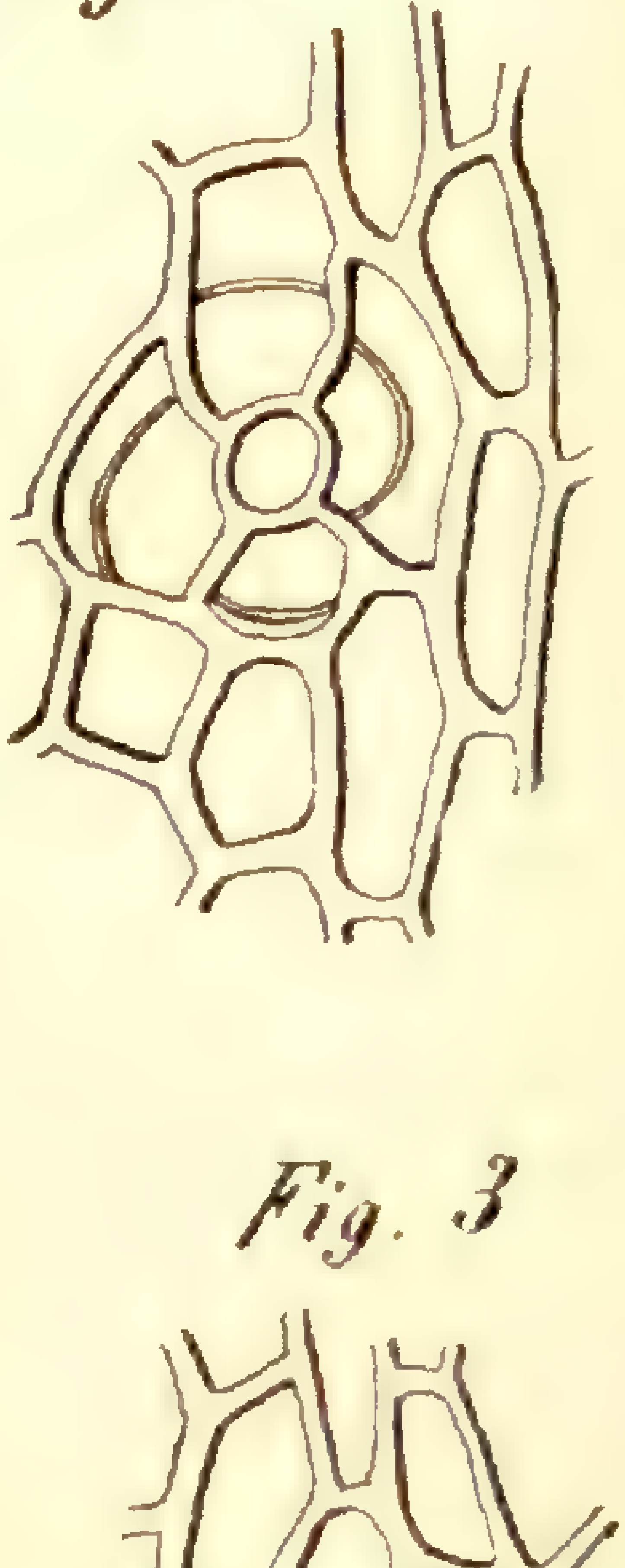

Fig. 3

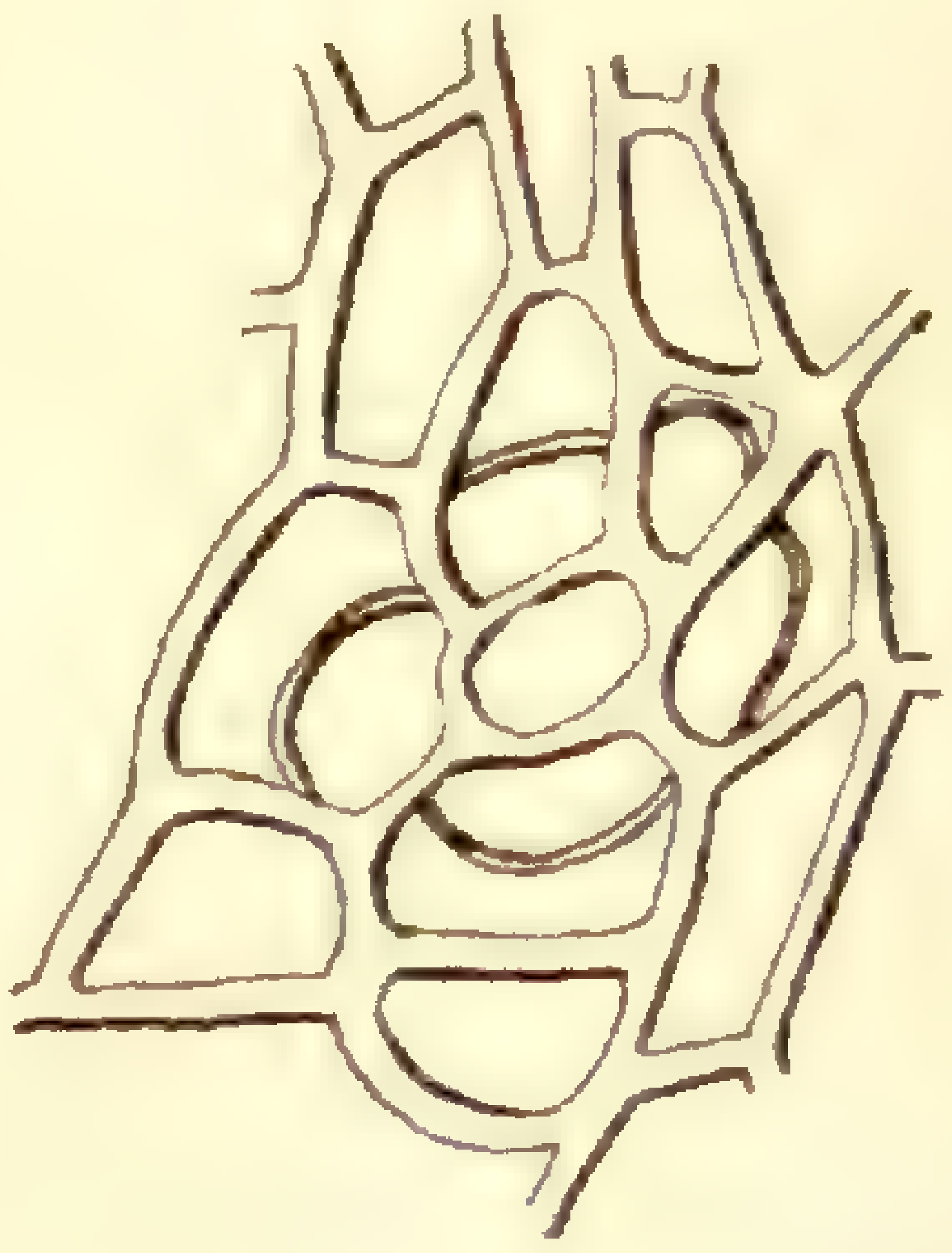

Fig. 1.—Epidermis of *Paleohillia Arkansana* × 90.
a, a, bands of long, narrow cells.
b, b, bands of short irregular cells, with three longitudinal rows of stomata.
c, c, stomata with four and six guardian cells respectively.
Fig. 2.—Stoma with four guardian cells × 300.
Fig. 3.—Stoma with five guardian cells × 300.

This curious plant, as already stated, was hollow, with the walls consisting of three or four, or possibly more, layers of cells. The epidermal cells are markedly separable into two kinds: first, narrow bands of three or four rows of thin-walled cells which are two to four times longer than broad, separated by broad areas or bands ten or twelve cells wide, of short irregularly quadrangular cells. In figure 1 a, a, represents the bands of narrow cells, and b, b, the short irregular cells. Under the microscope the two kinds of cells divide the surface longitudinally in very clearly mark parallel lines.

The stomata are the most remarkable feature about this plant. As may be seen by the drawing, the guardian cells are quite irregular in shape and appear to vary in number from four to six, the most frequent number being five.* The opening is in all cases large and in some instances appears even larger than either of its guardian cells. It is difficult to see how so large an orifice could be completely closed by them.

The stomata, it will be observed, are confined to the broad bands of irregular cells, and are also arranged in longitudinal rows, those next to the bands of long cells being numerous, while in the central row they are scattered, there being only about one-third as many as in the others. The orifice between the guardian cells is approximately circular. The guardian cells are themselves arranged in a more or less regularly circular manner, their shape depending on the number present. When there are only four they are rectangular with rounded outer sides; when there are five or more they are keystone-shaped, or broadly wedge-shaped.

I am at the present time unable to suggest any satisfactory relationship, either living or fossil, for this anomalous plant. The first thought when seeing the numerous fragmentary stems throughout the clay mass, and finding that they are hollow, is that they belong to *Equisetum*. But on examining large numbers of fragments, not a single joint with the characteristic teeth could be detected, and moreover the stomata are entirely different. It is of course well known that the stomata of living *Equisetum* have two pairs of guardian cells, but they are not all in the same horizontal plane, one pair, the "subsidiary cells," of Strasburger being below the other. The guardian cells are usually ornamented by silicified ridges radiating from the orifice, not a trace of which can be found in the fossil under discussion.

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*In figure 1 the guardian cells appear to be in the same plane as the epidermal cells. They are of course below them, but the lines of the overlying epidermal cells have not been drawn in, so that there may be less confusion in following their outline. Figures 2 and 3, much enlarged views of single stomata, make the real condition plain.

Some of the Bryophytes, notably the liverworts, have stomata with more than two guardian cells, but they are loosely cellular plants quite unlike this hollow-stemmed plant.

In the absence of more specific information as to its affinities, I have decided to describe this plant under a tentative name, recognizing the fact that this provisional name may be changed at any time provided the fossil can be more definitely placed. I had at first given it the name of *Hillia*, but as there is a genus of this name in Rubiaceae, I have called it *Paleohillia*. It commemorates the collector and is not intended to imply relationship with the Rubiaceous genus.

Observations upon some Oklahoma Plants.

By Edgar W. Olive.

The botany of Oklahoma is exceedingly interesting, because this territory is a borderland region between the Gray's Manual and Western Texas Manual regions. Until about five years ago, the plants of this district were but little known to botanists, and the results of recent collections disclose a flora rich in interesting forms. Especially valuable is a "List of Plants collected by C. S. Sheldon and M. A. Carleton in the Indian Territory in 1891," published as a contribution from the National Herbarium in 1892.

The months of July and August, 1893, were spent in and about Payne county, in the very northeast of Oklahoma, about 90 miles south of the Kansas line through the Cherokee strip, and about 150 miles west of Arkansas. This is in lat. 97° W. and is but a few miles south of the parallel bounding on the north Tennessee and North Carolina, so that the collections were made just south of the line of the extreme southwestern limit of Gray's Man. 6th Ed. About 175 species of Phanerogams and Pteridophytes were collected, about 60 of them new to Messrs. Sheldon and Carleton's list, most of these, however, the commoner plants, and 12 of which are not reported in Gray's Manual. Of these 12, 3 are not included in Dr. Coulter's Manual of the Texas Flora, nor 8 of them in his Botany of the Rocky Mountain region.

These 12 plants are *Talinum calycinum* Engelm., found abundantly on the red sandstone rocks outcroping in ravines and along the Cimarron River; *Desmanthus Jamesii* T. & G., very abundant on dry prairies; *Galactia mollis* Michx., in sand along the river banks; *Acacia filiculoides* (Cav.) Trel., abundant in the sandy woods; *Gaura villosa* Torr., showing gradations into forms; *Sesuvium Portulacastrum* L., in sand along the saline banks of the river; *Cynosciadium pinnatum* DC., but one plant collected by a roadside; *Aster patens* Ait., var. *gracilis* Hook., the variety not in Gray's Manual, very abundant in rich sandy ground near the river; *Baccharis glutinosa* Pers., the fertile plant conspicuous by its very long and white pappus along the sandy river banks; *Eriogonum longifolium* Nutt., on dry prairies; *Aphanostephus ramosissimus* DC., found in abundance in the sand of rich river bottoms; *Cooperia Drummondii* Herb., near Stillwater on rich prairies.

The flora of Oklahoma is very similar to that of southern Kansas. The climatic and geologic conditions are very similar in both regions, and this fact, combined with the fact of the proximity of the Cimarron and Arkansas rivers flowing southward through the territory from Kansas, tends to make the floras alike. Outcropping "red-beds" (whence probably the name *Oklahoma*—"home of the red earth") occur in both regions associated generally with a very sandy soil. Rich, sandy land, well timbered, occurs along the rivers and creeks, while back some distance on the uplands, prairies supplant the forests. The farther west one goes, the observer can readily notice the dwarfing of the trees as the regions of less rainfall are passed through, and many plants show gradation into dwarfed forms. Most of the plants of this whole district, moreover, present the characteristics of the plants of dry sterile regions, viz., thickened leaves and epidermis, sunken stomata, absence or narrowness of leaves, or an unusual amount of wooliness or hairiness.

There are quite a number of common oaks in some portions of this eastern part, Spanish oak, Post oak, but most abundant in the upland reduced forests is *Quercus nigra* L., the dwarfed, gnarled "black jack." There are some hickories, black walnuts, cottonwoods, and elms along the river and creeks, the elms bearing abundantly large bunches of mistletoe.

A few observations as to the occurrence and habitat of some plants may be interesting. In the rich sandy land along the river bottoms the commonest shrubs are *Cephalanthus occidentalis* L., *Stillingia sylvatica* L., *Rhus copallina* L. On *Stillingia* was found an *Aecidium* which has not been yet reported on this host, as far as can be determined. Somewhat abundant in similar places were *Argemone platyceras* Link and Otto, *Callirhoe involucrata* (Nutt.) A. Gray, *Parosela enneandra* (Nutt.) Britton, *Froelichia Floridana* (Nutt.) Moq., *Indigofera leptosepala* Nutt., *Aphanostephus ramosissimus* DC. In wet, salty sand near the river were *Pluchea camphorata* (L.) DC., *Sesuvium Portulacastrum* L., and in the dry sand, *Cycloloma atriplicifolium* (Spreng.) Coulter, *Baccharis glutinosa* Pers., and *Parosela lanata* (Spreng.) Britton. The latter is reported in Gray's Man. to have "3–4 pairs" of leaflets, while 6–7 pairs were usually present on the specimens collected. On the high bluffs of the river *Yucca glauca* Nutt. was not infrequent.

In the woods which extend back from the river bottoms two or three miles are *Cassia Chamaecrista* L., *C. nictitans* L., or "sensitive plant," *Desmanthus Jamesii* T. & G., *Clitoria Mariana* L., *Gaura villosa* Torr., *Onagra biennis* (L.), Scop., *grandiflora* Lindl., a beautiful passion-flower, *Passiflora incarnata* L., *Lacinaria squarrosa* (L.) Hill, *Chrysopsis villosa* Nutt., in many of its variable forms, *Asclepias verticillata* L., and *Acerates angustifolia* (Nutt.) Dec.; also low shrubs of *Bumelia lanuginosa* (Mx.) Pers. and several species of plum. A perhaps noteworthy point was the occurrence of *Ludwigia alternifolia* L. in sandy but perfectly *dry* ravines. Gray's Manual reports the habitat of this as "swamps."

The whole prairie region is characterized by an abundance of plants belonging to the orders Leguminosae and Compositae. Particularly abundant on the prairies are *Kuhnistera multiflora* (Nutt.)

Heller, *K. purpurea* (Vent.) MacM., *Amorpha canescens* Pursh, *Parosela aurea* (Nutt.) Britt., *Solidago Missouriensis* Nutt., *Helianthus mollis* Lam., *Hieracium longipilum* Torr. The fact is significant that of the 175 species collected, 33 were Leguminosae and 32 were Compositae. *Sabbatia angularis* (L.) Pursh, *S. campestris* Nutt. and *Buechnera Americana* L. give bright colors to the prairies during June and July; *Linum sulcatum* Riddell, *Ceanothus Americanus* L., *Jatropha stimulosa* Michx., *Euphorbia corollata* L., *E. petaloidea* Eng., *E. marginata* Pursh, occur on the richer prairies, while *Megapterium Missouriensis* (Sims) Spach, *Houstonia angustifolia* Mx., *Stenosiphon linifolium* (Nutt.) Britton, *Opuntia polyacantha* Haw., and *Gerardia densiflora* Benth., are found on dry sterile prairies. A very severe case of poisoning was incurred from collecting *Euphorbia corollata.*

A very paradise for a collector of aquatic vegetation is a large pond near Perkins, Oklahoma. Several Sagittarias, *Nelumbo lutea* Pers., *Potamogeton lonchites* Tuckerm., the latter growing "rarely in ponds" (Gray's Man.), *P. diversifolius* Raf., are most abundant throughout, while near the edges *Heteranthera limosa* (Sw.) Willd., *Ludwigia glandulosa* Walt., *Monniera rotundifolia* Mx., and *Marsilia vestita* Hook. & Grev. grow rank. Some of the specimens of this Marsilia growing both in and along the banks of the pond have petioles 7–8′ long, the type being reported in the Manuals 1–4′. Dr. Underwood, however, pronounces this undoubtedly *M. vestita.*

As suggested above, the special interest of this region lies in the fact of the meeting of two floras and the sometimes abrupt, generally gradual, transition of one into the other. The flora cannot be studied comprehensively except by an extended period of field work and by carefully noting all the environmental conditions. The farther west one goes into the territory the more sandy and desert the regions become; and such are the variations from some of the more eastern forms that many are classed as varieties, no doubt the result of a change in habitat. According to Mr. Coville's suggestions in his "Botany of Death Valley Expedition," the shrubs and trees and on the prairies the perennials should especially be noted to determine the characteristic plants of the flora.

Grateful acknowledgments are due to Dr. John M. Coulter and Professor E. B. Uline for kindly determining some of the species and checking most of the list of collections.

WABASH COLLEGE, CRAWFORDSVILLE, IND.

On the two Editions of Emory's Report, 1848.

For some time past I have been aware of the fact that there were two editions of Lieut. W. H. Emory's "Notes of a Military Reconnoissance," both bearing the same date (1848); but I supposed they were identical, except that one had appended to it the reports of Abert and Cooke and the journal of Johnston. But I now possess copies of both of these books, and find that they differ in various details, which are of importance on account of Prof. Torrey's reports on the botany of the expedition.

Both editions are Executive Documents of the 30th Congress, 1st session, and they are numbered 7 and 41, respectively. No. 7 was issued for the Senate. It contains nothing but Emory's report, with its seven appendices, and consists of 416 pages. Each age has [7] in the upper external corner. No. 41 was issued for the House. It contains the reports of Emory, Abert and Cooke, and Johnston's journal, and consists of 614 pages. "Ex. Doc. No. 41," appears in the middle of the top of each page, with the exception of pp. 145–158, in the botanical portion, which have [7] in the upper external corner. This is evidently a typographical error, and not a mistake in binding, for the pages are not the same as pp. 145–158 in No. 7.

In both of these volumes Professor Torrey's report on Emory's plants occupies pp. 135–159, constituting Appendix No. 2. My copy of No. 41 bears the following manuscript note at the top of page 135. "This appendix is full of gross typographical errors—the printer having refused to send me proof sheets according to agreement. J. Torrey." The same remark would apply with equal force to No. 7. Both books show evidence that they were published either carelessly or in very great haste. The principal differences between the two documents in the botanical portions are as follows:

1. In No. 7 Prof. Torrey's general report occupies pp. 13–5 155; page 156 contains an "Explanation of the Plates;" and on pp. 157–159 is a letter from Dr. Geo. Engelmann describing (from drawings only) the Cactaceae of the Expedition, in fine print. In No. 41 Prof. Torrey's general report occupies pp. 135–155 (but the matter on the various pages is differently distributed); Dr. Engelmann's letter extends from page 155 to page 159; and *there is no* "Explanation of the Plates."

2. In No. 41 three species are entirely omitted which are given in No. 7, viz.: (*a*) *Zinnia grandiflora Nutt.*, (*b*) *Convolvulus Nuttallii*, and (*c*) *Alternanthera? (Endotheca) lanuginosa.* Of these (*a*) and (*c*) are described, and (*b*) and (*c*) are published as new names. A person having reference to these in "Emory's Mil. Rec." and looking them up in No. 41, would be puzzled at their absence, and conclude that the references were incorrect.

3. The fourteen plates in No. 7 were lithographed by E. Weber & Co., Baltimore. Those in No. 41 are similar, but were lithographed by C. B. Graham, Washington. The latter are somewhat better (or less bad), from an artistic standpoint, but there seem to be no differences of importance—save that in No. 41 plate VI. is labeled *Baileya multiflora* instead of *B. multiradiata.*

4. In both documents Appendix No. 6, occupying pp. 386–414, consists of Lieut. Abert's "report of such objects of natural history as came under my observation while I was attached to the topographical party * * * during the journey from Fort Leavenworth to Bent's Fort. The plants which were collected were submitted to the inspection of Dr. Torrey, to whom I am indebted for their names." Prof. Torrey's list, to be found on pp. 406–414, differs somewhat in the two books, but this is of little importance, for it is a mere catalogue of names, without descriptions.

I hope that this note, published in the BULLETIN, may help to prevent trouble and confusion in the future.

JOHN HENDLEY BARNHART.

TARRYTOWN, N. Y., April 20, 1895.

Teratological Notes.

By Francis E. Lloyd.

Plate 247.

The many germinating acorns which were to be seen during the past winter in western Oregon afforded a good opportunity for studying the mode of growth of the seeds of *Quercus Garryana* Dougl. During the course of my observations a few cases of teratological interest have been noticed.

One of these is an acorn which, after having pushed its radicle out some distance, had met with a misfortune. Presumably a snail or other depredator, judging the young plant a tender morsel, had bitten into it just at the juncture of one of the petioles and the hypocotyl (Fig. I). The mouthful included the little plumule, so that further development of any or all of the remaining parts would have been in vain. The hypocotyl, nevertheless, continued to grow, the wound healing. Furthermore, the detached petiole healed and produced an incipient rootlet of its own.

In order to determine experimentally the power of the detached petiole to produce rootlets, three partly germinated acorns were chosen and a petiole and the hypocotyl in each were separated by cutting. In a few days the scars healed over, and in two of the acorns rootlets were formed, two in one (Fig. IIa) and four in the second. The third failed to grow.

Another acorn was found, from the ruptured apex of which three lengthened petioles had followed the protruding radicle. Two of these were more slender than the third, and were closely approximated at their bases. These the plumule had spread apart, pushing its way up between them. The relative positions of the three petioles can be understood from the diagram (Fig IVa) of a transverse section through the base of the plumule. It is evident that the two cotyledons with the approximated petioles are the equivalent of one in the normal seed. The earlier leaves are reduced to mere subulate bracts, and in their number and arrangement vary greatly. In these I observed no difference, except that they are more crowded in one region of the young stem, and this probably had no relation to the number of cotyledons.

A number of acorns have been found with two fertilized and developed ovules. The presence of the supernumerary seed is betrayed by the unsymmetrical shape of the acorn. The rightful occupant—if might makes right—is usually well developed, and pushes out its radicle earlier than does the intruder, which is correspondingly smaller and flattened and twisted out of shape. Occasionally, when the supernumerary seed is large, if its position is favorable it gets its radicle out of the ruptured apex first. At all events it makes a brave effort to reach soil and sunlight. A few acorns have been found in which the two plantlets had developed into two well-formed seedlings. Acorns containing more than one seed have all been found under young trees. In no case have I found such under aged trees.

BIOLOGICAL LABORATORY, PACIFIC UNIVERSITY.

Explanation of Plate 247.

FIG. 1.—"c," cotyledon; "f," foliar appendages; "p," petiole; "pl," plumule; "h," hypocotyl. The dotted lines indicate the portion excised.

FIG. 2.—The seedling after the wound had healed and the second root-tip had formed. R—original radicle; R_2—the rootlet of the cut petiole.

FIG. 2a.—A seed, the petiole of which was cut. After healing the separated petiole (p) produced two rootlets. The plumule continued to develop as seen.

FIG. 3.—Shows the end view of the seedling with three cotyledons, the petioles of which are shown in situ. The plumule (pl) projects through the smaller, paired petioles p_2 and p_3.

FIG. 4.—The same with the husk removed, and the three cotyledons outspread. The cotyledons c_2 and c_3 belong to the petioles p_2 and p_3 (in Fig. 3) respectively.

FIG. 4a.—Transverse section through the base of the plumule of Fig. 4.

FIG. 5.—An acorn with the husk removed showing the supernumerary seed in situ. Its hypocotyl (h) had grown, the radicle partially decayed and thrown off two new rootlets (a and b).

Contribution to the Characeous Plants of Maine—1.

BY F. L. HARVEY.

So far as we know but little attention has been given to the plants of this order by collectors in Maine; the species named in Redfield & Rand's Catalogue of the Plants of Mt. Desert being the only record we know of regarding them. We have recently been considering the few species found in the Blake Herbarium of the Maine State College, and, adding our own observations, bring the record to date.

Research will no doubt bring to light many more species. We are under obligation to Dr. Allen for professional courtesies. We will be pleased to learn of other species occurring in the State, or to know of Maine collectors of these interesting plants.

ORDER CHARACEAE.

FAMILY I. NITELLAE.

1. *Nitella opaca* Ag.

Blake Herb. Aroostook River (Blake), Sept., 1878.
Redfield & Rand's Cat. Plants of Mt. Desert, p. 227.
Common in small streams about Orono (Harvey).

2. *N. flexilis* Ag.

Western Maine (Kate Furbish.)
Rand & Redfield's Cat. Mt. Desert, p. 227.

Miss Furbish's plants show the monoecious fruiting and the abruptly acuminate leaves. The plants from Mt. Desert are doubtfully placed here by the editors of that catalogue.

FAMILY II. CHARACEAE.

3. *Chara coronata* A. Br.

Aroostook R., Me. (Blake) Sept. 1878.

4. *C. contraria* A. Br.

Caribou, Me., Sept., 1878.
The stream not mentioned in Blake's notes.

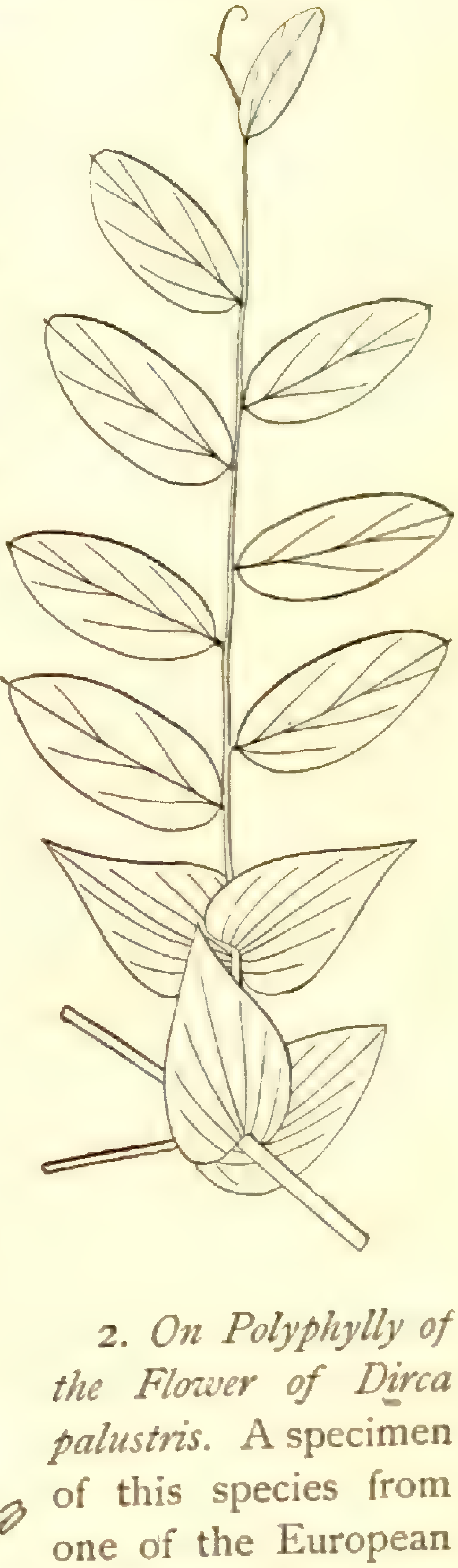
5. *C. fragilis* Desv.

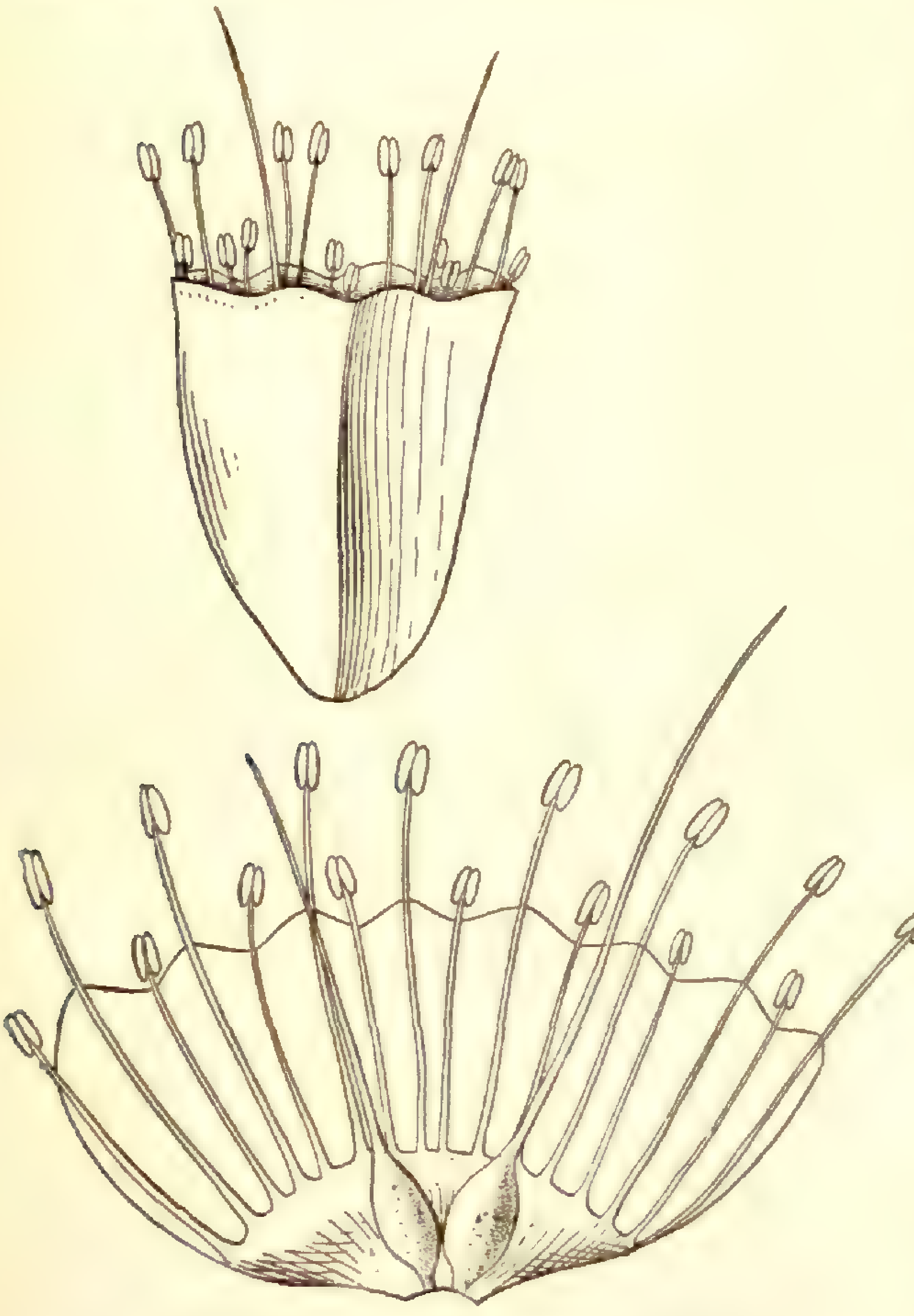
Very common in various streams in Penobscot Co. (Harvey.)

In Sunkhoze Stream, occurring on gravelly and rocky bottoms for a distance of ten miles, the patches sometimes covering the bottom of the stream for rods.

Teratological Notes.

1. *On the Stipules of Lathyrus polyphyllus.* Dr. Masters* only mentions additional stipules in the case of *Salix fragilis.* On a specimen of *Lathyrus polyphyllus* collected in California by Kellogg and Harford in 1868-1869, the lowest pair of leaflets is replaced by two stipules identical with those that subtend the rachis. The leaflets are normally alternate, but the additional stipules are opposite, as are the lower ones. About one-half of the leaves of the specimen are thus modified.





2. *On Polyphylly of the Flower of Dirca palustris.* A specimen of this species from one of the European botanic gardens shows this abnormal state in three ways.

1. Polyphylly of the calyx.
2. Polyphylly of the andrœcium.
3. Polyphylly of the gynœcium.

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*Veg. Teratol. 357.

Many instances of the multiplication of parts in the different whorls of a flowerhave been recorded. This takes place in different ways, and one or more whorls may be affected. In the present case there seems to be a union of two flowers, making a duplication of each whorl, or polyphylly of the calyx, the andrœcium and the gynœcium. The undulation-like teeth of the margin of the calyx are increased from four to eight, the stamens from eight to sixteen and the pistil from one to two. The change accurs in all the flowers on the specimen and modifies the shape of the calyx from "tubular-funnelform" to campanulate.

JOHN K. SMALL.

Reviews.

Systematische Phylogenie der Protisten und Pflanzen. Ernst Haeckel. 1st Portion. Berlin. 1894.

As the author states in his preface, he has been engaged for the past thirty years upon questions pertaining to the subject-matter of this volume. All are acquainted with the "History of Creation" and have enjoyed its generalizations, and the present volume offers a rare treat to those who would advance a step and enter into generalizations based upon more specific and detailed data.

He opens with a chapter upon Phylogenie, defining it, and giving Paleontology, Ontogony and Morphology as the sources for the working-out of the problems. He rapidly and skillfully sums up the positive and negative in the geological record; discusses the value of Ontogeny and outlines the principles of Morphology. A brief review of the methods is followed by a summary of the geological systems and the first chapter, including thirty-two pages, closes with a critical review of the monophyletic and polyphyletic theories of Phylogeny.

The second chapter, fifty pages, deals with the phylogeny of the Protista, where the beginnings of life are taken up. Mr. Haeckel's familiar Monera, "Structureless organisms without organs," again does service as a starting point from which the Protista arise, in which class he groups all those organisms "which do not build tissues;" calling those of a solitary turn of mind "Monobionten" and the more social "Coenobionten." Following the definition of the Protista, a paragraph or two is devoted to the differences in the plant and animal kingdoms. Here much stress is laid upon the synthetic character of the one and the analytic character of the other class of organisms. The plants are rechristened "Plasmodomen" and the animals "Plasmophagen" or plasma builders and plasma destroyers.

The Protista are then divided into three main groups, the atypical Protista; the plant type protista or Protophyta and the animal type protista or the Protozoa. In the first of these are included those organisms that show no particular affinity to either group, on account of an indifferent growth or because they may be at times either animal or vegetable in their functions, and are to be divided purely upon artificial grounds according to what seems to the author to be the predominant physiological activity. We note that the botanists gain the Peridineae and the zoölogists the Bacteria, which latter are said to be lacking a nucleus which, if we are not sadly mistaken, is somewhat "behind the times."

The typical Protophyta include those organisms in which

1. The cell-wall is surrounded by a special membrane which is entirely closed or has only a few openings; this membrane consisting of cellulose.

2. The cell-body is either entirely motionless throughout its life history, or, at rare intervals and in small degrees, moves about by means of flagellae, as in the swarm spores.

3. The cell is always colored, generally green or gold, and contains chromoplasts which generally contain chlorophyll, also at times diatomin, haemochromatin, etc.

4. The metabolism is entirely vegetable; the cell is "plasmodomen" and assimilates CO_2; it takes up no formed organic matter and possesses no mouth opening.

In this group are included (1) Algarien, (2) Algetten.

The pages following are too solid for abstracting, but are of interest with much philosophic thought; the phylogeny of the soul of the Protista forming an interesting extravaganza on pages 75, 76. The third chapter deals with the systematic phylogeny of the Protophyta; in this the starting point is with those atypical Protista that have a "vegetable tendency." Those without a cell nucleus, including many of the Cyanophyceae, under the name of Chromaceae begin the family tree. We can give here only the main lines of ascent, as the work is an abstract itself, and to further abstract it would out-Herod Herod. Through the Chromaceae the Algariae are reached in *Palmella,* from which Diatoms and Desmids diverge and represent radiating extremes of development in their respective lines. The Algetten, the second main class, includes many forms hitherto reckoned under the care of the zoölogists; many of the flagellate infusoria for instance. It includes all those single cell forms that have zoospores and flagellae movements: *Euglena*, *Protococcus*, *Peridinium*, *Volvox*, *Botrydium* and *Caulerpa* are included in order.

The fourth chapter treats of the Protozoa, already reviewed by the zoölogists in "Science."

The fifth chapter takes up the *general* morphology of the Metaphytes or those plants which are many-celled and tissue builders, including (a) Thallophyta, (b) Diaphyta, (c) Anthophyta. This chapter we consider the finest in the book and can be read by all botanists to some advantage independent of their interests, morphological, systematic or physiological. Chapters six, seven and eight take up the three classes respectively. The Thallophytes ascending through the Chlorophyceae, Protococcus to Confervales and branching in several directions; the Florideae, the highest branch, through *Bangia; Fucus*, through *Ectocarpus* and *Laminaria.* The Characeae a special branch through *Nitella.* The Ulvaceae to the form similar to *Riccia* and from them to chapter seven on the Diaphytes. Among the Thallophytes the fungi are represented as on offshoot from the Chlorophyceae, which is hardly tenable after Professor Farlow's well-founded suggestions upon this group, and the lichens are regarded in the Schwendenerian sense.

The Diaphytes include the Hepatics and Mosses. These are made to arise through a primitive *Riccia*, from thence through *Pellia* to the foliose forms and to *Haplomitrium* when a true axis is first reached and form this, through Sphagnums and Andreaceae or their common ancestor to the true mosses. Marchantiales and Anthoceratales are made blind alleys of growth.

The Pteridophyta are made to rise from the same ancestral Riccia-like form as the "Diaphytes," to a hypothetical "Archipterides," thence through the Hymenophyllaceae, when the stem divides into three lines, the Filices, the Equisetaceae and Lycopodiaceae, which last make the way for the Anthophyta.

These, in the closing chapter, through the Cycads and some forms similar to the fossil Noeggerathia split into a forest of stems. The Gymnosperms representing a growth through the Araucarieae, while through some forms resembling the Australian "Casaurineae" the Angiosperms were developed.

The critic would need to be a specialist in many branches, and could write a book equalling, in size, the original, if all of the interesting points touched upon were to be discussed, but to give an opinion of the work in a word, we can heartily say that a good and mighty work has been accomplished.

Upon points of classification varying points of view must always be borne in mind. Possibly the author has made a mistake in a fundamental point, upon which he devotes much space and thought to elucidate for having cautioned others not to confound Homology, form: with Analogy, function: he deliberately makes his most sweeping classes and distinctions upon a purely physiological, hence functional basis.

The numerous points of difference which would interest workers in special fields can not be discussed here, but the work is to be recommended to all readers as one of more than common interest.

SMITH ELY JELLIFFE.

Volume I., of Anton Kerner von Marilaun's *Pflanzenleben*, translated by Prof. F. W. Oliver as *The Natural History of Plants*, has recently been issued from the press of Henry Holt & Co. This work will be warmly received by all lovers of nature. In a style simple, attractive and still thoroughly scientific, Professor von Marilaun considers in this first volume: The Living Principle in Plants, Absorption of Nutriment, Conduction of Food, Formation of Organic Matter from the Absorbed Inorganic Food, Metabolism and Transport of Materials, Growth and Construction of Plants and Plant-forms as Completed Structures.

Under there captions are discussed in a most charming manner hundreds of interesting biological questions that have been practically excluded from the attention of very many people through the technicality of authors. Now, indeed, for the first time, are thrown open wide the gates to the natural history of plants and all may enter and enjoy the wide range of the whole field. The above mentioned seemingly unattractive subjects are invested with a charm that must arouse the enthusiasm of all. Thus under the rather unattractive title of Absorption of Nutriment, is discussed, among many other subjects, the adjustment of leaves to the welfare of the root; plants with traps and pitfalls to ensnare animals. So also under conduction of food a chapter is given to all those wonderful adaptations whereby the plant may suffer no inconvenience from untoward external conditions that would interfere in any way with its life current; and then again are taken up those adjustments of branches and that exquisite moulding of leaf forms and their relation to the branches whereby the best interests of the plant are subserved, and in this connection follows a discussion of the protection of leaves against the attacks of animals. The work is in a sense exhaustive, copiously illustrated, the wood engravings especially being excellent, and the translator reflects most happily the spirit of the author. C. C. CURTIS.

The London Catalogue of British Plants. The recent publication of the ninth edition of the list of higher plants growing naturally in Great Britain and Ireland (the Characeae are appended), affords opportunity for ascertaining just how widely British botanists differ from our recently issued "List of Pteridophytes and Spermatophytes" in the nomenclature of genera. From the statements of some writers one might be lead to infer that the disagreements would be very numerous, but it appears that this is not the case.

The total number of genera listed in the English publication, exclusive of the Characeae, is 538. The "List of Pteridophyta and Spermatophyta growing without cultivation in eastern North America" contains 970. Allowing for differences in generic limitations, the London Catalogue sometimes uniting genera which the "Check-list" holds distinct, and *vice versa*, there are about

440 genera in common, all but 18 of which bear the same names. I have indicated these in the following table:

CHECK-LIST.	LONDON CATALOGUE.
Capnoides Adans. 1763.	*Neckeria* Scop. 1777 (1).
Roripa Scop. 1760.	*Nasturtium* L. 1735 (2).
Alsine L. 1753.	*Stellaria* L. (3).
Tissa Adans. 1763.	*Buda* Adans. 1763 (4).
Spiesia Neck. 1790.	*Oxytropis* DC. 1802 (5).
Sanguisorba L. 1753.	*Poterium* L. (6).
Silybum Gaertn. 1788.	*Mariana* Hill, 1762 (7).
Legouzia Durand, 1782.	*Specularia* Heist. 1748 (8).
Limonium Adans. 1763.	*Statice* L. (9).
Statice L. 1753.	*Armeria* L. (10).
Udora Nutt. 1818.	*Elodea* Michx. 1803 (11).
Leptorchis Thouars, 1808.	*Liparis* L. C. Richard, 1818 (12).
Gyrostachys Pers. 1807.	*Spiranthes* L. C. Richard, 1818 (13).
Peramium Salisb. 1812.	*Goodyera* R. Br. 1813 (14).
Juncoides Adans. 1763.	*Luzula* DC. 1805 (15).
Savastana Schrank, 1789.	*Hierochloë* S. G. Gmelin, 1747. (16).
Panicularia Fabric. 1763.	*Glyceria* R. Br. 1810 (17).
Dryopteris Adans. 1763.	*Polystichum* Roth, 1794 (18).

NOTES.

1. Both lists thus reject *Corydalis* Vent. 1803. While the British botanists were taking up another name, it seems strange that they could not accept *Capnoides*, which is quite as well defined as any of the rest of Adanson's genera, and of these they have admitted a considerable number: *Meum*, *Arctostaphylos*, *Cicendia*, *Epipactis*, *Polygonatum*, *Mibora*, *Apera*, for example.

2. The Linnaen use of *Nasturtium* is confined to the first edition of his "Systema," published in 1735. He did not use it subsequently and it was only again taken up by R. Brown in 1812. Meanwhile *Roripa* had been published and well defined. The American rejection of *Nasturtium* is thus based on the Rochester agreement, adopted by the Genoa congress, and more recently approved by the Austro-German botanists, to begin generic nomenclature at 1753.

3. Here, again the "starting-point" for generic names comes into consideration, and *Alsine* has precedence of place in the first edition of the "Species Plantarum," both genera being recognized in that work. It appears possible to me that both genera will again be recognized, *Alsine* for *A. media* and its relatives and *Stellaria* for such types as *S. graminea.*

4. Both lists thus reject *Spergularia* Presl, and *Lepigonum* Wahl. *Tissa* has

precedence of place in Adanson's "Familles des Plantes" and is accepted by Baillon in his "Histoire" and by Pax in Engler-Prantl's "Natürliche Pflanzenfamilien."

5. Necker's name for this genus is satisfactorily identified by the description; I have been unable to discover any reason under any set of principles which really warrants its rejection. The authors of the London Catalogue have admitted *Boretta* proposed by him. Why not *Spiesia?*

6. *Poterium* L. is considered, and in my opinion correctly, by European authors, as monotypic, including only *P. spinosum* L. of southern Europe.

7. This is a case in which the London Catalogue is right, and the American list wrong, under all rules, and we should be grateful for the correction. The citations are MARIANA Hill, Veg. Syst. **4**: 19. 1762. *Mariana Marianum* (L.) Hill, Hort. Kew. 61. 1769. Hill's use of duplicate binomials is the earliest which has come to my attention; he proposed a number of others in the same publication.

8. *Specularia* Heist. was taken up by no subsequent author until employed by Alphonse DeCandolle in 1830. The 1753 "starting point" excludes it. Meanwhile *Legouzia* had been published and the genus defined.

9–10. In adopting *Statice* L. for *S. Armeria* L. and its allies, and *Limonium* Adans. for *Statice Limonium* and its congeners, the American list returns to the use of *Statice* in the "Species Plantarum" of 1753, in which the genus *Armeria* was not taken up. The use of these generic names, as adopted in the London Catalogue, dates only from their publication by Willdenow, 1809.

11. *Elodea* was regarded by the American committee as a homonym of *Elodes* Adans. 1763. I have recently discussed this point (Science, n. s., **2**: 5. 1895), showing that *Philotria* Raf., has a few months' priority over *Udora*. It will be noted that both lists reject *Anacharis*.

12. The validity of publication of Du Petit Thouars' genera of Orchidaceae has been questioned, but also ably defended. I have not had access to his paper.

13. There can be no doubt as to Persoon's intention in proposing the name *Gyrostachys* (*Gyrostachis* in original), as he refers to *Ophrys spiralis* L., to illustrate it; this species is included in *Spiranthes* by recent authors.

14. There can be no possibility of mistaking Salisbury's meaning in the publication of *Peramium*, for he bases it on one of the same species cited by R. Brown under *Goodyera* a year later. It is true that Salisbury published no description of the the genus; but many other widely accepted genera rest on just this form of publication.

15. My remarks under *Capnoides* apply equally well to this. Perhaps the compilers of the London Catalogue objected to the termination *oides*, but they have good authority for its use in the publication by Benthan and Hooker (Genera, **2**: 301) of *Mniodes* A. Gray, and this is also accepted in the Kew Index.

16. Gmelin's name antedates the first edition of "Species Plantarum" and was not again used until after the publication of *Savastana*.

17. I have not seen the original publication of Fabricius, but *Panicularia* and *Glyceria* are cited as equivalent by Kuntze.

18. Both lists thus reject *Aspidium* Sw. 1800. It should be added that the London Catalogue recognizes *Polystichum* Roth, and *Lastraea* Presl, as genera.

The percentage of difference in the two lists is 4.09 per cent.

The changes of generic names in the ninth edition of the London Catalogue, from those used in the eighth edition, published in 1886, and which agree with the American catalogue, are as follows:

Nymphaea L., 1753, for *Nuphar* Sibth. & Smith, 1808.
Castalia Salisb., 1805, for *Nymphaea* J. E. Smith, 1806.
Bursa Weber, 1780, for *Capsella* Medic., 1792.
Coronopus Gaertn., 1791, for *Senebiera* DC., 1799.
Schollera Roth, 1788, for *Oxycoccus* Pers., 1805.
Pneumaria Hill, 1762, for *Mertensia* Roth, 1797.*
Homalocenchrus Mieg., 1768, for *Leersia* Sw., 1788.
Weingaertneria Bernh., 1800, for *Corynephorus* Beauv., 1812.
Sieglingia Bernh., 1800, for *Triodia* Beauv., 1812.

It would appear, from a consideration of these comparisons, that the British botanists were, after all that has been said, gradually coming to recognize the validity of the principle of priority, in at least generic nomenclature. There also appears to be no good reason why this process should not continue, so that by the time of the issue of the tenth edition of their useful list the percentage of difference might be reduced to 2 per cent. or perhaps less.

For, if the recognition of this principle had been complete, and the 1753 "starting-point" had been accepted, not more than six of the genera would have borne different names. N. L. B.

Among Rhode Island Wild Flowers. By W. Whitman Bailey. Providence, R. I. Preston and Rounds. 1895. Cloth. 16 mo. pp. 105.

Under the above title, Prof. Bailey has grouped a number of chapters which we may well designate as bits of floral poetry, written in prose. The author does not attempt to give a list of Rhode Island plants, but to call attention to the fact that the flowers of the State are of surpassing beauty and interest. Rhode Island lies on the line dividing our northern and southern floras, and hence contains many interesting forms.

After an introduction, we have a scheme of plant distribution, showing the wide variation of plant life, in plants of the salt water, the salt marsh, the river, the sea beach, the bog, the forest and the like. Nearly half the book is taken up with a description of the Favored Spots, and this constitutes the chief charm. A few choice plants are mentioned in each case, while a delightful picture of the locality is presented, enticing the botanist to visit the spot and search for the treasures growing there. Especially interesting is the chapter on Wild Flowers of Block Island, where the presence or the absence of certain forms is suggestive of speculation as to the distribution of plants. The weeds of the State claim a separate discussion. Interesting to a botanist they are, as Prof. Bailey says, " A flower garden is lovely ; but for vital, everyday, continual interest, a weed-grown yard is far-and-away more fascinating."

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* The American publication maintains *Pneumaria* and *Mertensia* as distinct genera.

A list of Rhode Island trees is appended. We welcome the little book, for it cannot fail to fill its readers with a love for our wild flowers in general. WALTER DEANE.

Proceedings of the Botanical Club, A. A. A. S., Springfield Meeting, August 29th to September 2d, 1895.

The meetings were held in the room assigned to Section " G," in the State Street Baptist Church.

THURSDAY MORNING, AUGUST 29TH.

In the absence of the President, Prof. D. H. Campbell, and of the Secretary, Prof. F. C. Newcombe, the meetings of the Club were placed in organization by Prof. Geo. F. Atkinson. Hon. David F. Day was made Chairman pro tem. and Prof. H. L. Bolley, Secretary.

On motion of Professor Atkinson, those having papers to present were requested to hand titles of the same to the Secretary upon the day preceding that upon which it was wished the paper should be read.

The meeting adjourned at 11:30 to meet at 9 A. M., Friday, August 30th.

FRIDAY MORNING, AUGUST 30TH.

The Club met as ordered, with President D. H. Campbell in the chair. In order to facilitate the reading of papers, the titles of which for the first time in the history of the Club now appeared printed in the regular daily program of the A. A. A. S., the reading of the minutes of the previous meetings was dispensed with.

The first paper presented was on "Crimson Clover Hair-balls," by Mr. F. V. Coville. These balls, composed of the hairs of the Crimson Clover, *Trifolium incarnatum*, had been found in the stomach of a horse. Mr. Coville exhibited specimens, also mounted slides showing their composition.

Professor Byron D. Halsted reported the results of field experiments with beans. He had found that 25 per cent. of plants grown on soil previously occupied by beans were affected by spot, whereas when grown on new soil only 6 per cent. were diseased.

Mrs. Elizabeth G Britton reported corrections upon descriptions of *Coscinodon*.

Mr. O. F. Cook remarked upon "A peculiar Habit of a Liberian Species of *Polyporus*," and exhibited specimens showing various degrees of prolification, one pileus arising from another upon very extended delicate stalks, due perhaps, to the extreme moisture of their environment.

An apparatus for the bacteriological sampling of well-water was described and illustrated by Professor H. L. Bolley, the merits of which were facilities afforded for sterilization in toto, and in general açcuracy of work afforded without contamination by air and water.

Mr. C. L. Pollard described the methods of work in the National Herbarium. The colored labels in use to designate type specimens were of especial interest, because of the new range offered for convenience of reference.

Passing to order of unfinished business Dr. Trelease called for the report of the committee appointed at the Rochester meeting to prepare and print a check list of the plants of northeastern North America. Dr. N. L. Britton, as chairman of the committee, submitted the appended report:

"The committee reports that it has completed the task assigned it by the Club at its Rochester and Madison meetings, by preparing, to the best of its ability, a list of plants in accordance with instructions received at those meetings. The committee herewith presents a printed copy of such list, which has been prepared and published without expense to the Club.

" For the committee,

"N. L. BRITTON,

" *Chairman*."

Mr. O. F. Cook, seconded by Dr. F. H. Knowlton, moved the acceptance of the report. After some discussion as to the scope of the term "acceptance" as here moved, an adjournment was taken until afternoon without action being taken upon the motion.

FRIDAY AFTERNOON, AUGUST 30TH.

Following the regular session of Section "G" the Club, upon further discussion, adopted the motion of Mr. Cook to accept the report.

On motion of Prof. L. H. Bailey the Club then proceeded to the discussion opened in the morning by passing the regular program.

On motion of Mr. F. V. Coville, seconded by Prof. E. L. Greene, and carried, it was resolved that the meeting proceed to a discussion of the principles on which the list was based.

Dr. B. L. Robinson then alluded to certain generic names which he thought had been inconsistently employed in the list. He also discussed the admission of specific names first published as synonyms; the practice of admitting such names was defended by Prof. Greene, who maintained that the practice of "taking up of synonyms" as used by the committee was a principle established by Gray.

Professor N. L. Britton also maintained that the principles adopted by the Club at the Rochester meeting required the admission of such synomyms as those cited by Dr. Robinson.

After much rambling discussion the following resolution offered by Professor Britton, and seconded by Professor L. H. Bailey, was adopted:

Resolved, That in view of the opinions which have been expressed at home and abroad on principles of nomenclature, during the progress of the work of the committee, the matter be referred to the committee for consideration and report at the next meeting of the Club.

Prof. Britton also introduced the following resolution:

Resolved, That the committee be increased to eleven members by the additions of Dr. B. L. Robinson and Dr. C. S. Sargent.

At this point Dr. B. L. Robinson stated that because of the radical difference of opinion existing between himself and the majority of the present committee upon certain vital points, it was plain to him that he must decline to serve upon the committee. In compliance with these wishes, the Club reluctantly accepted Dr. Robinson's withdrawal, and upon motion, Professor L. H. Bailey's name was substituted in the resolution, and the same adopted as amended. The Club then adjourned to meet at the same place at 9 A. M., Monday, September 2d.

MONDAY MORNING, SEPTEMBER 2D.

Prof. N. L. Britton, Dr. W. H. Seaman and Mr. Walter Deane were appointed a committee to nominate officers for the next meeting.

The report of Treasurer F. C. Newcombe, showing the balance in hand, $6.57, was read and accepted, as here appended:

ANN ARBOR, MICH., August 26, 1895.

BOTANICAL CLUB, A. A. A. S.

Report of the Treasurer for the year ending August 26, 1895.

1894.	RECEIPTS.	
August 17.	Voluntary contributions from members present at Brooklyn	$7.32
1895.	DISBURSEMENTS.	
August 26.	Express charges on records, Ann Arbor to Springfield	.75
	Balance on hand, ...	6.57

The first paper was read by Mrs. Elizabeth G. Britton, entitled "Some Notes on *Dicranella heteromala* and allied Species."

Prof. J. C. Arthur described a new form of clinostat, and remarked on its advantages over similar machines previously constructed, its great superiority being multiple arms for holding plants, allowing of checks upon tests made.

A paper by Mr. A. B. Seymour describing the Mary A. Gilbreth collection illustrating the dissemination of seeds, now the property of Radcliffe College, was read by Mrs. Flora W. Patterson.

Judge David F. Day described the dissemination of the seeds of *Zinnia* by means of the persistent ray-flowers.

Mr. Walter Deane mentioned the expulsion of the seeds from the capsules of the Witch-hazel, *Hamamelis Virginica*, stating that he had observed them strike a pane of glass fourteen feet away with almost force enough to crack it.

Judge Day spoke also on the desirability of further observations on climbing plants, referring to his observations on the genus *Dioscorea*, some species of which twine in one direction, others in another. He mentioned *Aconitum uncinatum* as a twining plant, and had observed a secondary peduncle in *Anemone Virginiana* twining around the primary one.

The following papers were read by title during the meetings:

"Notes upon Pig-nut Hickories," by William Trelease.

"Experiments with Lime as a preventive of Club-root," by B. D. Halsted.

"Notes on the alkaline Reaction of the vascular Juices of Plants," by Erwin F. Smith.

"Continuation of Experiments upon the Relation between the fertile and sterile Leaves of *Onoclea*," by George F. Atkinson.

"A Hybrid between an Egg Plant and Tomato Plant," by P. H. Rolfs.

"A Method of using Formalin Gelatine as a Mounting Medium," by A. F. Woods.

The committee appointed to nominate officers submitted the following names and they were unanimously elected:

President, Frederick V. Coville, Washington, D. C.
Vice-President, Conway MacMillan, Minneapolis, Minn.
Secretary and Treasurer, J. F. Cowell, Buffalo, N. Y.

The Secretary was requested to append to the minutes for future reference, a list of persons who have been officers of the Club, since its formation.

The Club then adjourned to meet as usual during the meeting of the Association in 1896.

Fifty-three botanists were registered during the different sessions.

H. L. Bolley,
Secretary pro tem.

Titles of Papers read before the Section of Botany, A. A. A. S., Springfield Meeting.

The following were presented either in full, in abstract or by title. A summary of the proceedings may be found in the September issue of the "Botanical Gazette."

A Leaf Rot of Cabbage. By H. L. Russell.

The Southern Tomato Blight. By Erwin F. Smith.

Observations on the Development of *Uncinula spiralis*. By B. T. Galloway.

The Effect of Sudden Changes of Turgor and of Temperature on Growth. By Rodney H. True.

Recording Apparatus for the Study of Transpiration of Plants. By Albert F. Woods.

Pressure, Normal Work and Surplus Energy in Growing Plants. By George M. Holferty.

Notes on the Ninth Edition of the London Catalogue of British Plants. By N. L. Britton.

Obolaria Virginica L. A Morphological and Anatomical Study. By Theo. Holm.

Botany of Yakutat Bay, Alaska. By Frederick V. Coville.

Variation after Birth. By L. H. Bailey.

Rejuvenation and Heredity. By Chas. S. Minot.

The Distinction Between Animals and Plants. By J. C. Arthur.

Fungous Gardens in the Nests of an Ant, *Atta tardigrada* Buckl., near Washington, D. C. By Walter T. Swingle.

Poisoning by Broad-leaved Laurel, *Kalmia latifolia*. By Frederick V. Coville.

The Physiology of *Isopyrum biternatum* L. D. T. MacDougal.

The Transmission of Stimuli-effects in *Mimosa pudica* L. By D. T. MacDougal.

Personal Nomenclature in the Myxomycetes. By O. F. Cook.

A New California Liverwort. By Douglas H. Campbell.

The Number of Spore Mother Cells in the Sporangia of Ferns. By Willis L. Jepson.

The Constancy of the Bacterial Flora of Fore Milk. By H. L. Bolley.

The Watermelon Wilt and other Wilt Diseases due to *Fusarium*. By Erwin F. Smith.

Antidromy in Plants. By George Macloskie.

Proceedings of the Botanical Society of America, Springfield Meeting, Aug. 26th and 27th, 1895.

The botanists conducted their sessions at the meeting of the Botanical Society of America with Prof. Wm. Trelease, President, in the chair, and Prof. C. R. Barnes, Secretary. They elected Prof. C. E. Bessey, President; Prof. W. P. Wilson, Vice-President; Prof. C. R. Barnes, Secretary, and Mr. Arthur Hollick, Treasurer, for the ensuing year. They also elected Dr. A. W. Chapman an honorary member; and Mr. M. S. Bebb, Prof. W. R. Dudley, Prof. D. P. Penhallow and Prof. W. A. Setchell as active members. It was decided to deposit such books and pamphlets as may be received for the Society, in the Library of the Missouri Botanical Garden.

Most of the papers presented were brief summaries of larger works and enterprises, on which the authors are engaged.

Mrs. N. L. Britton read a paper on "Some Notes on a Revision of the genus *Mnium*," in which an attempt was made to show how nearly the American specimens correspond with European types and descriptions.

Dr. N. L. Britton gave a brief account of the history of the founding of the New York Botanical Garden, describing the site in Bronx Park and outlining the plans of the board of managers.

Prof. L. H. Bailey presented the following resolution which was passed unanimously:

"*Resolved*, That the Botanical Society of America express its thanks to Dr. N. L. Brinton for his account of the condition and progress of the movement for a botanical garden in the City of New York, and congratulate the people of that city on the prospect of its rapid development; and, furthermore, that the Society commend the board of managers of the garden and its board of scientific directors for their wisdom in securing a broad foundation and an assurance of liberal management."

Prof. George F. Atkinson presented a paper as a contribution to the knowledge of North American phycophilous fungi.

Mr. Arthur Hollick exhibited a series of plates illustrating the fossil leaves of *Liriodendropsis*, contrasting them with the stages of development of the leaves in *Liriodendron*, showing that there is a parallelism between the shapes of the earliest rudimentary leaves of the living species with that of the development of the fossil ones.

Prof. Roland Thaxter exhibited the plates of a monograph on the Laboulbeniaceae which he is preparing, explaining the structure of these minute fungi, which grow on living insects, and describing several new genera and species. He also made a few remarks on the phycomycetous fungi, and showed diagrams of one new genus and species.

Mr. F. V. Coville gave a brief abstract of his revision of the genus *Juncus*, subdividing it into subgenera, and recognizing seventy-six species in North America.

Prof. Chas. R. Barnes made remarks on a revision of the genus *Dicranum* which he is preparing, with the assistance of Mr. Rodney H. True, recognizing thirty-three North American species, and explaining his reasons for rejecting several recently described.

Index to recent Literature relating to American Botany.

Anderson, A. P. The Grand Period of Growth in a Fruit of *Cucurbita Pepo*, determined by Weight. Bull. Geol. Nat. Hist. Surv. Minn. **9**: 238–279. *pl. 11–20.* 5 Mr. 1895.

Bessey, C. E. A Protest against the "Rochester Rules." Am. Nat. **29**: 666–668. Jl. 1895.
Opposes the Harvard herbarium recommendations.

Bessey, C. E. Progress of the Botanical Survey of Nebraska. Am. Nat. **29**: 580–582. Je. 1895.

Bolander, H. N. A new *Erythronium*. Eryth. **3**: 127. 15 Au. 1895.
Erythronium Johnsonii from southern Oregon.

Coulter, J. M. and **Rose, J. N.** *Deanea*, a new Genus of Umbelliferae from Mexico. Bot. Gaz. **20**: 372. *pl. 27.* 15 Au. 1895.

Coville, F. V. *Juncus scirpoides* and its immediate Relatives. Bull. Torr. Bot. Club, **22**: 302–305. 31 Jl. 1895.

Davenport, G. E. Daniel Cady Eaton. Bot. Gaz. **20**: 366–369. *pl. 26 A.* 15 Au. 1895.

Greene, E. L. Novitates occidentales.—XVI. Eryth. **3**: 123–126. 15 Au. 1895.

Describes new species in *Clarkia, Eriophyllum, Erigeron, Allocarya* and *Calliprora.*

Holm, T. A Study of some anatomical Characters of North American Gramineae.—IV. Bot. Gaz. **20**: 362–365. *pl. 26.* 15 Au. 1895.

Describes the leaf-structure of *Leersia.*

Holzinger, I. M. A Preliminary List of the Mosses of Minnesota. Bull. Geol. Nat. Hist. Surv. Minn. 9: 280–294. 5 Mr. 1895.

Jack, J. G. Another Herbarium Pest. Gard. & For. **8**: 323–324. *f. 45.* 14 Au. 1895.

Illustrating and describing *Ephestia interpunctella.*

Jack, J. G. The Hazels. Gard. & For. **8**: 344–346. *f. 48.* 28 Au. 1895.

Notes on *Corylus rostrata.*

Johnson, L. N. Some new and rare Desmids of the United States. —II. Bull. Torr. Bot. Club, **22**: 289–298. *pl. 239, 240.* 31 Jl. 1895.

Describes new species in *Arthrodesmus, Cosmocladium* and *Cosmarium.*

Kellerman, W. A. On Plant Names. Journ. Columbus Hort. Soc. **10**: 7–10. Mr. 1895.

Maintains the necessity of adherence to priority.

La Mance, L. S. *Iris hexagona.* Gard. & For. **8**: 329. 14 Au. 1895.

Recording the discovery of *Iris hexagona La Mance* Gerard, in Benton County, Arkansas.

Lotsy, J. P. Some Euphorbiaceae from Guatemala. Bot. Gaz. **20**: 348–355. *pl. 24, 25.* 15 Au. 1895.

Describes a number of new species.

Magnus, P. Die Teleutosporen der *Uredo Aspidiotus* Peck. Ber. Deutsch. Bot. Gesell. **13**: 285–288. *pl. 23.* 25 Jl. 1895.

Mez, C. Einige Bemerkungen über *Nidulariopsis.* Ber. Deutsch. Bot. Gesell. **13**: 236–239. 25 Jl. 1895.

Nash, G. V. The Genus *Cenchrus* in North America. Bull. Torr. Bot. Club, **22**: 298–302. 31 Jl. 1895.

Pammel, L. H. Some troublesome Iowa Weeds. Rep. Iowa Agric. Soc. **1894**: 523–539. 1895.

Figures of *Salsola Kali* var. *Tragus*, *Arctium Lappa*, *Xanthium Canadense*, *Ambrosia trifida*, *Hordeum jubatum*, *Capsella Bursa-pastoris*, *Cuscuta Epithymum*, with accounts of these weeds.

Pammel, L. H. The Geographical Distribution of Plants. Rep. Iowa State Hort. Soc. **29**: 324–433. 1895.

Penhallow, D. P. *Rhus* Poisoning. Gard. & For. **8**: 359. 4 S. 1895.

Robinson, B. L. The Nomenclature Question. Bot. Gaz. **20**: 370–371. 15 Au. 1895.

Rolfe, R. A. New Orchids. Kew Bull. 104: 191–195. Au. 1895.

Tropical American species in *Pleurothallis*, *Batemaria*, *Maxillaria*, *Notylia* and *Pelexia*.

Rolfe, R. A. *Vanillas* of Commerce. Kew Bull. 104: 169–178. Au. 1895.

An historic and descriptive account of the species yielding aromatic fruits. Two are described as new.

Rydberg, P. A. New Species of *Physalis*. Bull. Torr. Bot. Club, **22**: 306–308. 31 Jl. 1895.

Sadebeck, R. Einige neue Beobachtungen und kritische Bemerkungen über die Exoascaceae. Ber. Deutsch. Bot. Gesell. **13**: 265–280. *pl. 21.* 25 Jl. 1895.

References to many American species.

Sargent, C. S. The American White Birches. Gard & For. **8**: 355. *f. 50.* 4 S. 1895.

Note on *Betula populifolia* and *B. papyrifera*.

Setchell, W. A. On the Classification and Geographical Distribution of the Laminariaceae. Trans. Conn. Acad. Arts and Sci. **9**: Part 2, 333–375. 1895.

Sheldon, E. P. Compilation of Records of some Minnesota Flowering Plants. Bull. Geol. Nat. Hist. Surv. Minn. 9: 223–227. 5 Mr. 1895.

Smith, J. B. Why certain Hickories died. Gard. & For. **8**: 352–353. *f. 49.* 4 S. 1895.

Tilden, J. E. List of fresh-water Algae collected in Minnesota during 1894. Bull. Geol. Nat. Hist. Surv. Minn. 9: 228–237. 5 Mr. 1895.

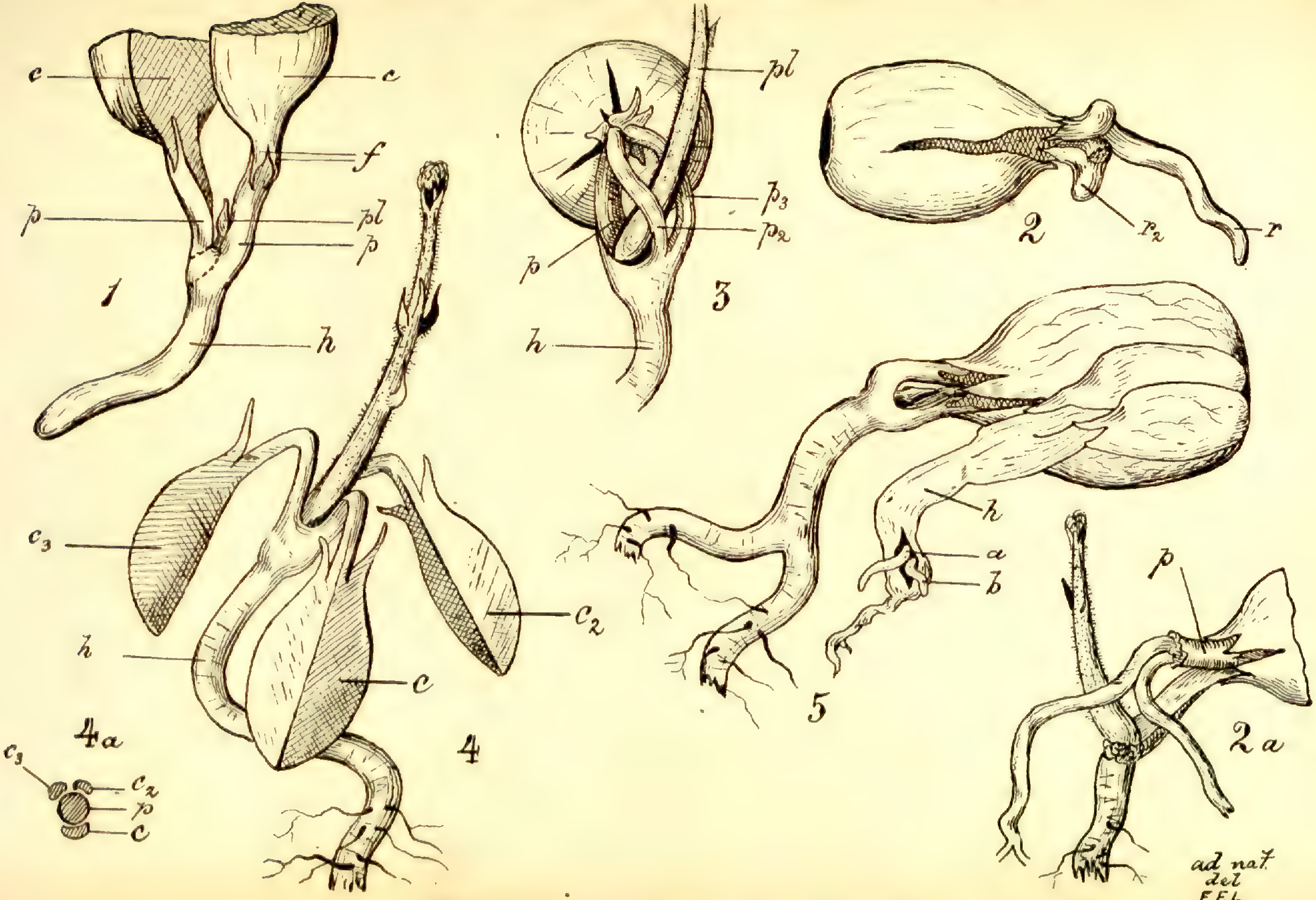
Toumey, J. W. *Opuntia fulgida.* Gard. & For. **8**: 324–326. *f. 46.* 14 Au. 1895.

Toumey, J. W. Vegetal Dissemination in the Genus *Opuntia*. Bot. Gaz. **20**: 356–361. 15 Au. 1895.

Uline, E. B., and **Bray, W. L.** Synopsis of North American *Amaranthaceae*—III. Bot. Gaz. **20**: 337–344. 15 Au. 1895.

Ward, F. L. The Nomenclature Question. Bull. Torr. Bot. Club, **22**: 308–329. 31 Jl. 1895.

Wilcox, E. M., Chairman. Report of the Committee on Botany. Journ. Columbus Hort. Soc. **10**: 5. Mr. 1895.
Record of species of *Polyporus* near Columbus, Ohio.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TERATOLOGY IN QUERCUS GARRYANA.

Surplus Books for Sale from the Library of Dr. M. C. Cooke.

146 Junction Road, London N., England.

Balfour, J. B. Botany of Socotra. 4°. 100 plates. Edinburgh.
Hedwig. Theoria generationis and Hist. Nat. Muscorum. 4°.
Lamarck and DeCandolle. Flore Francaise. 6 vols., 8°.
Steudel. Nomenclator Botanicus. 8°, board.
Linnaeus. Flora Suecica. First Edition.
Leers. Flora Herbornensis. 16 pl., 8°.
Acharius. Synopsis Lichenum.
Marsilius. Dissert: de generatione Fungorum.
Retz. Observationes Botanicae. Folio.
Vaillant. Botanicon Parisiense. Folio.
Queckett. Histological Catalogue. 4°. 2 vols., cloth.
Luerssen. Medico-Pharmaceutik Botanik. Vol. 1, Kryptogamen, 8°, paper.
Lindley, Dr. Flora Medica. 1 vol., cloth.
Waring, Dr. Pharmacopaeia of India. 8°, cloth.
Fluckiger, Dr., and Hanbury, D. Pharmacographia. 8°.
Hanbury, D. Notes on Chinese Materia Medica.
Hanbury, D. Science Papers. 1 vol., 8°.
Waring, Dr. Bibliotheca Therapeutica. 2 vols., 8°.
Christison, Dr. On Poisons. 8°, 1 vol.
Allen and Thomson. Expedition to the Niger. 8°, 2 vols.
Farlow, W. G. Marine Algae of New England. 8°, paper.
Toni and Levi. Flora Algologica Venezia. Parts I. and III.
Toni and Levi. L' Algarum Zanardini. 8°.
Underwood. Catalogue of N. Am. Hepaticae. 8°.
Tuckerman. Synopsis of Lichens of New England.
Bescherelle. Prodromus Bryologiae Mexicanae. 8°.
Harvey, Dr. Phycologia Britannica. 4 vols. in 2 half morocco, gilt tops. Splendid copy, first issue.
Sowerby's English Botany. 2d Edition, Vol. XII., only containing Algae. 8° cloth.
Goebel, K. Morphologische und Biologische Studien. 8°, 15 plates.
Queckett, J. Lectures on Histology. 2 vols., 8°, cloth.
Queckett, J. Treatise on the Microscope. 8°, cloth.
Humboldt. Flora Friburgensis. 4°, board.
Ardissone. Enum. della Alghe della Marca di Ancona. 4°
De Notaris. Epilogo della Briologia Italica. Roy. 8°, half calf.
Wahlenberg. Flora Suecica. 2 vols. 8°.
Bauhin. Theatrum Botanicum. Folio.
Meyer. Primitiae Florae Essequeboensis. 4°, calf.
Sullivant. Musci and Hepaticae of U. S. 8°.
Kickx, J. Flore cryptogamique des Flandres. 2 vols. in 1. Half calf. 1867.
Roth, A. G. Catalecta Botanica. 3 vols., 8°, half calf. 1806.
Schrader, H. Spicilegium Florae Germanicae. 8°. 1794.
Haller, A. Flora Jenensis. 12°. 1745.
Weigel. Flora Pomerano Rugica. 12°. 1769.
Olhaff. Elenchus Plantarum. 12°. 1656.
Sprengel, C. Florae Halensis. 8°. 1806 and 2 suppl.
Schumacher. Plantae Saellandiae. 2 vols., 1801.
Schlechtendal. Flora Berolinensis. Part 2, Cryptogamia. 1824.
Wulff, J. C. Flora Borussica. 12° 1765.
Schrank. Florae Salisburgensis. 12. 1792.
Weinmann. Enum: Stirpium in Agro Petropolitano. 8°. 1837.
Martius. Flora Erlangensis Crypt. 8, 6 pl., 1817.

Nuovo Giornale Botanico Italiano, 1872 to 1891. 20 years complete, 18 in 9½ calf, rest in parts.

Michelia. Ed. P. A. Saccardo, 1879 to 1882 in 2 vols., half calf (all published).

Hedwigia (Ed. Rabenhorst, etc.), 1852 to 1891 (Vol. II. imperfect) together in 15 vols., cloth).

Flora (Regensburg), vols. 34 to 47. 14 vols., cloth.

Notarisia, Commentarium Phycologiae, 1886–1891. Parts 1 to 25 (wanting part 21).

La Nuova Notarisia. 1890–1891. 7 parts.

Revue Mycologique (Roumeguere). 1888–1891. 13 vols. in 6, cloth.

Rabenhorst's Algae Europaea Aquae dulces. 3 parts in 2 vols., half calf, complete, 1864.

Monthly Microscopical Journal. (Ed. Dr. Lawson.) 18 vols., cloth. 1869–1877.

Grevillea (Ed. M. C. Cooke). Complete set in parts, 20 vols., 1872–1892. Complete sets out of print.

Hassalls, Dr. British Fresh Water Algae. 2 vols., cloth.

Smith, W. British Diatomaceae. 2 vols., cloth.

Ralfs, J. British Desmidiae. 1 vol., half calf.

Bornet et Thuret. Notes Algologiques, part 2 only, folio, plates.

Flora of Herefordshire. Mosses by Aug. Ley. Fungi by M. C. Cooke. 1 vol., 8°, cloth. 1889.

Hooker, W. J., and Baker, J. G. Synopsis Filicum. Colored plates, 8°, cloth. 1868.

DeBary, A. Morphologie und Biologie der Pilze. Mycetozoen und Bacterien. 8°, uncut. 1884.

Natural History Review. Vols. I. to VI., 1854 to 1859 and 1861 to 1865, 11 vols. (wanting Vol. VII.).

American Naturalist, 1867 to 1886 (wanting 1876), in 17 vols., half calf, 2 vols in parts. Also 1887–8 complete; 1889 (wanting 266, 270, 274, 275); 1890 complete; 1891 (wanting 298, 300).

American Entomologist, and American Botanist and Entomologist. 1868–1870. 2 vols. in one, half calf.

Ray (John). Historia Plantarum. 3 vols., folio.

Mitten, W. Musci Indiae Orientalis. 8°, with Griffith's Muscologia Itineris Assamica and Griffith's Notulae ad plantas Asiaticas, part 2. Cryptogamia in 1 vol., 8°, half calf.

Buxbaum J. C. Plantarum minus cognitarum. Complete in 2 vols, 4°.

Girod Chautraus. Recherches chimiques et micro. sur les Conferves. Fol. 36 pl. half calf. 1802.

Gerarde's Herbal. Old folio, wanting title and last page of index, otherwise good condition.

Botanical Tracts, chiefly Cryptogamia, many vols. requiring separate list.

Greville's Scottish Cryptogamic Flora. 6 vols., half morocco, gilt. Colored plates.

Many other works, specially on Fungi, not enumerated here.

In applying for details of price, etc., quote the headings here written.

London, July, 1895.

Contributions from the Herbarium of Columbia College.

[The numbers omitted from this list are out of print.]

VOLUME I.

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... 25 cents.

No. 5. New or Noteworthy North American Phanerogams. By N. L. Britton (1888), ... 25 cents.

No. 6. An Enumeration of the Plants Collected by Dr. H. H. Rusby in South America, 1886–1887. By N. L. Britton. (Twenty-three parts published; not yet completed.)

No. 7. The Genus *Hicoria* of Rafinesque. By N. L. Britton (1888), . . 25 cents.

No. 9. A List of Plants Collected by Dr. E. A. Mearns at Fort Verde and in the Mogollon and San Francisco Mountains, Arizona, 1884–1888. By N. L. Britton.

The General Floral Characters of the San Francisco and Mogollon Mountains and the Adjacent Region. By H. H. Rusby (1888), ... 25 cents.

No. 11. Preliminary Notes on the North American Species of the Genus *Tissa*, Adans. By N. L. Britton (1889), ... 25 cents.

No. 13. New or Noteworthy North American Phanerogams, II. By N. L. Britton (1889), ... 25 cents.

No. 15. A Descriptive List of Species of the Genus *Heuchera*. By Wm. E. Wheelock (1890), ... 25 cents.

No. 16. New or Noteworthy North American Phanerogams, III. By N. L. Britton (1890), ... 25 cents.

No. 17. The Flora of the Desert of Atacama. By Thos. Morong (1891), . 25 cents.

No. 20. New or Noteworthy North American Phanerogams, IV. By N. L. Britton. (1891), ... 25 cents.

No. 21. Notes on the North American Species of Eriocauleæ. By Thos. Morong (1891), ... 25 cents.

No. 22. New or Noteworthy North American Phanerogams, V. By N. L. Britton (1891), ... 25 cents.

No. 24. Review of the North American Species of the Genus *Xyris*. By Heinrich Ries (1892), ... 25 cents.

No. 25. A Preliminary List of the Species of the Genus *Meibomia* occurring in the United States and British America. By Anna M. Vail (1892), . 25 cents.

VOLUME II.

No. 26. A List of Species of the Genera *Scirpus* and *Rynchospora* occurring in North America. By N. L. Britton (1892), ... 25 cents.

No. 27. Note on a Collection of Tertiary Fossil Plants from Potosi, Bolivia. By N. L. Britton (1892), ... 25 cents.

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Vol. 22. OCTOBER, 1895. No. 10.

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A MONTHLY JOURNAL OF BOTANY.

EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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OF THE

TORREY BOTANICAL CLUB.

Vol. 22. Lancaster, Pa., October 31, 1895. No. 10.

New or noteworthy American Grasses.—I.

By Geo. V. Nash.

Erianthus compactus n. sp. Culm erect, 4°–8° tall, stout, its nodes barbed, its summit and the axis of the panicle densely pubescent with appressed long rigid silky hairs. Sheaths glabrous or pubescent at the apex; leaves scabrous above, sparingly appressed-pubescent beneath, 6′–2° long, 3″–6″ wide, long-acuminate, narrowed toward the base; panicle narrowly oblong, 4′–6′ in length, about 1½′ wide, branches erect, 1′–2′ long; spikelets crowded, the internodes of the rachis about 1″ long; outer scales of the spikelet about 2½″ long, exceeding the pedicels and about equalling the basal hairs, lanceolate, acuminate, pubescent with long spreading hairs; inner scales shorter, the awn 5′–10″ long, straight, scabrous.

In moist or wet soil, New Jersey to North Carolina and Tennessee. The compact panicle composed of short erect branches, the short internodes of the rachis, and the crowded small spikelets readily distinguish this plant from the other straight-awned species.

SYNTHERISMA Walt. Fl. Car. 76 (1788).

[*Digitaria* Scop. Fl. Carn. Ed. 2, 1: 52. 1772. Not Heist. 1763].

The Digitaria section of *Panicum* is certainly sufficiently distinct to take generic rank and it has been so regarded by many authors. *Panicum* as now generally understood comprises too many forms. It would seem preferable to restrict the genus to the Eupanieae.

The name *Digitaria* was originally applied by Heister (Adans. Fam. Pl. 2: 38. 1763), to the *Tripsacum* of Linnaeus, and antedates by nine years the *Digitaria* of Scopoli (Fl. Carn. Ed. 2, 1: 52. 1772), who applied it to a group of plants that have since been considered by many as only a section of *Panicum*. This name is therefore a synonym of *Tripsacum* and not available. The oldest available name appears to be *Syntherisma* of Walter. A partial sysonymy of the three species occurring in the north-eastern United States would be as follows:

1. SYNTHERISMA SANGUINALIS (L.).
   Panicum sanguinale L. Sp. Pl. 57. 1753.
   Digitaria sanguinalis Scop. Fl. Carn. Ed. 2, 1: 52. 1772.
   Syntherisma praecox Walt. Fl. Car. 76. 1788.
   Paspalum sanguinale Lam. Tabl. Encycl. 1: 176. 1791.
2. SYNTHERISMA LINEARIS (Krock.).
   Panicum lineare Krock. Fl. Sil. 1: 95. 1787.
   Syntherisma serotina Walt. Fl. Car. 76. 1788.
   Digitaria humifusa Pers. Syn. 1: 85. 1805.
   Syntherisma glabra Schrad. Fl. Germ. 1: 163. 1806.
   Panicum glabrum Gaud. Agrost. 1: 22. 1811.
3. SYNTHERISMA FILIFORMIS (L.).
   Panicum filiforme L. Sp. Pl. 57. 1753.
   Paspalum filiforme Sw. Prodr. 22. 1788.
   Syntherisma villosa Walt. Fl. Car. 74. 1788.
   Digitaria filiformis Muhl. Gram. 131. 1817.

PANICUM PORTERIANUM nom. n.

Panicum latifolium Walt. Fl. Car. 73. 1788. Not Linnæus, 1753.

Panicum Walteri Poir. in Lam. Encycl. Suppl. 4: 282. 1816. Not Pursh, 1814.

Panicum latifolium var. *molle* Vasey, Bull. Bot. Div., U. S. Dept. of Agric. 8: 33. 1889.

Search has failed to disclose an available published name for this plant. The Linnaean name belongs to a tropical species. The *P. Walteri* of Poiret is antedated by two years by Pursh's name which was applied to an entirely different plant, the *P. Crus-galli* var. *hispidum* of Torrey. The varietal name of Vasey has already been used. It is necessary, therefore, to give this well-known plant a name, and the above is proposed in honor of Prof. Thos. C. Porter.

PANICUM SCRIBNERIANUM nom. n.

Panicum scoparium S. Wats. in A. Gray, Man. Ed. 6, 632. 1890. Not Lam.

Panicum scoparium var. *minor* Scribn. Bull Univ. Tenn. 7: 48. 1894. Not *P. capillare* var *minor* Muhl. 1817.

This plant is certainly not the *P. scoparium* of Lamarck. That is found only in the southern mountains and is a tall large-leaved grass with a few-flowered panicle. There seems to be no available name published for this plant, and so the above is proposed, in honor of Prof. F. L. Scribner, who was the first to indicate its difference from *P. scoparium* Lam.

PANICUM MINUS (Muhl.).

Panicum diffusum Pursh, Fl. Am. Sept, 1 : 68. 1814.

Panicum capillare var. *minus* Muhl. Gram. 124. 1817.

Panicum capillare var. *sylvaticum* Torr. Fl. U. S. 149. 1824.

Panicum Philadelphicum Bernh; Nees. Fl. Bras. 198. 1829.

This plant is readily distinguished from *P. capillare*, of which it has been considered a variety by its more slender habit, and smaller spikelets in pairs at the extremities of the ultimate divisions of the smaller and less branched panicle.

PANICUM BOREALE n. sp. Culms at first erect and simple, 1°–2° tall, later sometimes decumbent and somewhat branched, smooth and glabrous. Sheaths shorter than the internodes, smooth and glabrous, ciliate; ligule short, ciliate; leaves 3′–5′ long, ¼′–½′ wide, erect, truncate or rounded at the sparsely ciliate base, acuminate; panicle 2′–4′ in length, ovate, branches 1′–2′ long, spreading or ascending; spikelets 1″ long, about equalling the pedicels, ellipsoid, pubescent; first scale ovate, obtusish, about one-third the length of the spikelet; second and third ovate, 7-nerved, pubescent, equalling the fourth; fourth oval, chartaceous, acute, slightly exceeding ¾″ in length.

Moist soil, Newfoundland and Ontario to New York, Vermont and Minnesota. This plant was first noted by the writer in 1893 in the Catskill Mts., near Cario, N. Y. The smaller forms somewhat resemble *P. laxiflorum*, but the glabrous sheaths and shorter leaves, and the different shaped spikelets readily distinguish it from that species. No. 222, Robinson and Schrenk, 1894, and Macoun's plant, collected at Windsor, N. S., June 29, 1883, belong here.

Panicum sphagnicolum n. sp. Culms 2°–3° long, at first simple, later repeatedly dichotomously branched, the branches very divergent. Primary sheaths hirsute, those of the branches glabrous; ligule a ring of short hairs; leaves smooth and glabrous, the primary 2′–3½ long, 2″–5″ wide, those of the branches 1′ long or less, ½″–1½″ wide, appressed; primary panicle about 2′ in length, the branches ½′–1′ long, spreading; secondary panicles about ½′ long, raceme-like; spikelets 1¼″ long, few and appressed, pubescent; first scale ovate, acute, 1–3-nerved, about half the length of the spikelet; second scale broadly ovate, 7-nerved, somewhat shorter than the 7–9-nerved third one, the fourth chartaceous, smooth, elliptic, acute, slightly exceeding 1″ in length and equalling the third.

The late and much branched state was collected by the writer this summer in a sphagnum bog at Lake City, Florida, and will be distributed as No. 2500. The main stem rises through the sphagnum and then divides dichotomously, the branches spreading out over the surface of the moss, the ends being erect. The early and simple form was found by A. W. Bitting in a cypress swamp at the same place, on April 2, 1892.

IXOPHORUS Schlecht. Linnaea, 31: 420. 1861–62.

[Setaria Beauv. Agrost. 113. 1812. Not Ach. 1798.]

Otto Kuntze (Rev. Gen. Pl. 767) has referred these grasses to the genus *Chamaeraphis* R. Br., and this disposition of them has been accepted by several writers. But *Chamaeraphis* is a tropical genus in which the spikelet and bristle fall attached, while in the plants in question the spikelet articulates above the bristles, hence leaving them persistent when it falls. Feeling confident that the two groups are generically distinct, I have sought for a published name for the latter, and find *Ixophorus* of Schlechtendahl to be the earliest one available. It is based on *Urochloa uniseta* Presl, which is *Setaria uniseta* Fourn. The forms occurring in the northeastern United States are as follows:

1. Ixophorus verticillatus (L.).

Panicum verticillatum L. Sp. Pl. Ed. 2, 82. 1762.

Setaria verticillata Beauv. Agrost. 51. 1812.

2. IXOPHORUS GLAUCUS (L.).
Panicum glaucum L. Sp. Pl. 56. 1753.
Setaria glauca Beauv. Agrost. 51. 1812.

3. IXOPHORUS ITALICUS (L.).
Panicum Italicum L. Sp. Pl. 56. 1753.
Setaria Italica R. & S. Syst. **2**: 493. 1817.

4. IXOPHORUS VIRIDIS (L.).
Panicum viride L. Sp. Pl. Ed. 2, 83. 1762.
Setaria viridis Beauv. Agrost. 51. 1812.

STIPA AVENACIOIDES n. sp. Culms 2°–4° tall, simple, erect, slender, smooth or puberulent below the lower nodes. Sheaths about half the length of the long internodes, smooth and glabrous; ligule obtuse or acute, 1″ long or less; leaves involute-setaceous, smooth and glabrous, the basal about 1° long, those of the culm 1′–5′ long, the uppermost often nearly wanting; panicle simple, 4′–10′ in length, finally long-exserted, the scabrous branches 1′–3′ long, the lower in pairs; spikelets few; lower halves of the empty scales purple, 5-nerved below, acuminate, the lower 8″–10″ in length, the upper slightly longer; flowering scale with a ring of short brown hairs at the apex, brown, otherwise glabrous, 7″–8″ long, including the callus which is 3″–4″ long, and covered with appressed brown silky hairs increasing in length toward the top; awn 3′–4′ long, pubescent below, twisted for about half its length, tightly so at the base, twice bent.

Collected by the writer in 1895 in the pine lands near Cassia, Lake Co., Florida, No. 2051.

CAMPULOSUS CHAPADENSIS Trin. Spec. Gram. *pl. 303.*

Ctenium Chapadense Doell, Mart. Fl. Bras. **2**: Part 3, 73. 1878.

This plant was found growing plentifully by the writer this summer in the flat woods at Lake City, Florida, no. 2212. A. H. Curtiss collected the same in East Florida in 1875; his no. 4058 also appears to be this plant. It was also secured by Fredholm in Duval Co., Fla., in 1893, no. 313.

It differs from *C. aromatica* (Walt.) Scribn. (*Ctenium Americanum* Spreng.) in its more slender habit and narrower spikes; smaller spikelets divergent from the rachis, not pectinate; the scales narrower and very acute; the awns more delicate and much longer.

CHLORIS NEGLECTA n. sp. Culms 2°–4° tall, erect, much compressed, smooth and glabrous. Sheaths glaucous, compressed, those at the base of the culm crowded and equitant; ligule a ring of short hairs; leaves smooth and glabrous, glaucous, 4′–15′ long, 2″–4″ wide, abruptly acute, the uppermost culm leaf short, and usually remote from the infloresence, or often wanting; spikes 4–6, 3′–5′ long, erect or slightly spreading; spikelets divergent to the triangular rachis, which is scabrous on the angles; empty scales of the spikelet 1-nerved, scabrous on the keel, the first ovate, acute, about two-thirds as long as the second; second 2-toothed, the teeth obtuse and erose at the apex, oblong, 1½″–2″ long, including the scabrous awn which is ½″ long; third scale about 1½″ long including the awn which is ½″ in length, brown, ovate, 3-nerved, the nerves pubescent with long ascending hairs; fourth scale empty, 1″ long, elliptic in outline, cucullate, remote from the third, bearing an awn about ½″ long just below the apex; seed ¾″ long, narrowly oval in outline, triangular, translucent, yellowish streaked with purple.

Resembles *C. Floridana* Vasey; that species differs in having only 1 or 2 spikes; larger spikelets having 5 scales and 2 flowers, the upper one staminate; second empty scale broad and rounded at the erose apex; the hairs on the nerves of the third scale shorter; the fourth scale obovate and obliquely truncate at the apex.

Collected by the writer near Orange Bend, Lake Co., Florida, during the past summer, in low pine lands, no. 2149. It was also secured by A. H. Curtiss at Jacksonville in 1875; his number 3445 is the same. Fredholm obtained it along the banks of the St. John's River in Duval Co., Florida, in 1893, no. 319.

Notes on some Cyanophyceae of New England.

By William Albert Setchell.

The Cyanophyceae or Blue-Green Algae of the United States are little represented in collections and exsiccatae, and their occurrence and distribution is in great need of more careful study. For many years there has been a lack of good monographs relating to the group, and the redescribing under many different names of the same form made the matter of the identification both of genera and of species so difficult that there has been little temptation to the ordinary student to pay any attention at all to any of the forms.

Recently, however, there have been published two monographs, the results of the patient working over of abundant materials by men of such experience and insight that the filamentous species of the Cyanophyceae are now arranged and defined in a most satisfactory fashion.

The heterocysted forms, multiplying by means of hormogonia, are given in the "Revision des Nostocacées Heterocystées" by Bornet and Flahault (Ann. Sci. Nat. (VII.) **3**: 323–381, 1886; **4**: 343–373, 1886; **5**: 51–129, 1887; **7**: 177–262, 1888), and the homocysted forms with the same kind of reproduction are given in the "Monographie des Oscillariées" by Gomont (Ibid. VII. **15**: 263–368, *pl. 6–14*, 1892; **16**: 91–264, *pl. 1–8*, 1892.)

In both of these works a considerable number of species are credited to America, chiefly from specimens collected by Farlow, Collins, Holden, Wolle and the writer, but many more are to be expected and the writer hopes to be able to supply at some future time a full list of all found within our boundaries.

The marine forms have been much more studied than those of the fresh waters, and have been mentioned in the papers of Farlow and Collins. The account of the species of the fresh waters found in Wolle (Fresh Water Algae of the United States, Bethlehem, 1887) is, however, so confused and inexact as to allow no dependence to be placed upon it. Consequently we must, for the present, accept as a summary of the knowledge of our species the information contained in the two monographs mentioned above and proceed to work out from them and with their aid.

The following species, occurring for the most part in New England, seem to deserve mention.

Calothrix Juliana (Menegh.) B. & F., known only in this country from Mill Brook, Shelburne, N. H., where it was collected by Prof. W. G. Farlow, has occurred to the writer in Massopoag Brook, Sharon, Mass., and in Trading Cove Brook, Norwich, Conn. It grew upon stones in small tufts consisting of a few erect parallel filaments and could easily be distinguished by the touch, even on stones thickly covered with diatoms and other forms. It is easily distinguished from any other of our species by the absence of heterocysts. It grows upon wood as well as stones in the Quinebaug River, in Lisbon, Conn.

C. Braunii B. & F., credited by Bornet and Flahault to Germany and Denmark, was first found in this country by the writer, growing upon stones in a small brook at Sharon, Mass. Later it was found near Bridgeport, Conn., by Mr. Isaac Holden, growing upon wood and stones. It also forms extended patches on rounded stones in a small rivulet at Cataumet, Mass. It is of rapid growth, forming patches which are at first small and orbicular, but later enlarging and confluent into broad expansions of indefinite extent and shape, and often becoming decidedly verrucose on the surface. In color the patches vary from dark green to nearly black. The filaments are short and parallel and the structure of the patch resembles that of *Isactis plana*, but, of course, lacks the common enclosing matrix of that form.

RIVULARIA BORNETIANA n. sp. This curious species was found growing on the stems and leaves of *Ruppia maritima*, forming solid spherical thalli varying from somewhat less than a millimeter to something over a centimeter in diameter, according to age. Frequently a row of closely-placed spheres coalesce into a cylindrical mass 5–8 centimeters long. The thalli are of fairly firm consistency and vary in color from a deep bluish-black when young to a light olive green or pale yellow when old. They are not at all incrusted with lime. The filaments radiate in a regular fashion from the center, becoming, however, decidedly flexuous in the older thalli. They vary in diameter from 8–20 μ, and separate readily from one another on crushing. The sheath is wide and conconspicuous, colorless to deep brown in color, and very much lamellose and ocreate above. It varies in width below from 2–4 μ, sometimes becoming as wide as 20 μ. The trichome is usually about 4 μ in diameter, but occasionally reaches 16 μ. It is usually very much torulose when young, but very little so when older. The cells are from one-half to five times as long as broad. The cell limits are distinct in younger but very obscure in the older specimens, and the cell contents are light blue and provided with a few scattered granules. The heterocysts are basal, from depressed globular to ellipsoidal in shape, and from 6–8 μ in diameter. The terminal hairs are long and slender in the younger plants, but are almost wanting in the older ones.

For several years this species has been found in abundance in shallow water ahout the edges of Watch Hill Pond, in southwestern Rhode Island. The pond is separated from the open Atlantic Ocean by only a narrow line of sand dunes, through and over which the autumnal and winter storms often dash the surf. Consequently the water of the pond has a distinctly saltish taste. The *Rivularia* is associated with *Anabaena variabilis*, *Phormidium Valderianum*, *Microcoleus chthonoplastes*, *Chara aspera*, *Chara crinita* and various species of *Closterium*, *Scenedesmus*, etc.

This species approaches *R. Biasolettiana* in structure, but differs from it decidedly in habit, and it was thought at first it might perhaps be an epiphytic form of that species. But the globular shape of the thalli is exceedingly constant, and although carefully sought for, typical *R. Biasolettiana* was not found anywhere in the same vicinity. It seems best therefore to regard it as a distinct species, and the writer takes great pleasure in dedicating it to Dr. Edouard Bornet, of Paris, who has done so much toward furthering our knowledge of this group of plants.

R. Biasolettiana Menegh. occurs in fairly typical form in perfectly fresh water at Gardner's Lake, in eastern Connecticut. It forms small flattened thalli on stones along the shores of the lake.

Capsosira Brebissonii Kuetz., occurring in Sweden, France and Germany, grows also in this country upon a large rock on the eastern side of Round Pond at Lantern Hill, near Mystic, Conn- It forms small hemispherical black thalli from 1–2 mm. in diam. eter. They are crushed with some difficulty, but then show the *Stigonema*-like filaments with lateral heterocysts very plainly. It occurs sparingly also upon submerged dead wood.

Nostochopsis lobatus Wood, found near Philadelphia by Wood and in Vermont by Faxon, has occurred to the writer in some abundance at Mt. Carmel, about seven miles north of New Haven. The thalli grew upon stones in more or less rapid water in a brook just west of the " head" of the mountain.

Microchaete tenera Thuret, not hitherto credited to this country, grows in various localities in Connecticut. Specimens collected near Norwich and examined by Dr. Bornet, have cylindrical spores in a series, exactly corresponding to those described for *M. diplosiphon* Gomont. This species much mixed with various gelatinous algae occurs upon dripping rocks near Norwich and New Haven, Conn.

Scytonema crispum (Ag.) B. & F. This species, known as *Scytonema cincinnatum* or *Lyngbya cincinnata*, although not credited to North America by Bornet and Flahault, is probably not uncommon in the Eastern United States. Wolle had it from Pennsylvania or New Jersey, as is evidenced by a specimen in the writer's possession. Mr. Isaac Holden has found it near Lanesville, Conn.; Mr. W. J. V. Osterhout finds it in abundance near Providence, R. I.; Mr. Wesley R. Coe, in Florida; Dr. J. E. Humphrey, in Jamaica, W. I., and the writer about New Haven, Conn. The filaments vary very much. Sometimes both branches and heterocysts are rare and the species looks very much like a *Lyngbya*, very often the scanty branches occur single and adjacent to a heterocyst and it resembles greatly a *Tolypothrix*, while the geminate branches midway between two heterocysts, characteristic of *Scytonema* are generally found only after long and careful search.

Scytonema Javanicum (Kuetz) Bornet, one of the species with erect branches agglutinated into *Symploca*-like fascicles and previously credited chiefly to the tropics (Jáva, Brazil and Guyana), but also found in France, according to Bornet and Flahault, reappears in this country in small quantity, growing on the trunks of trees in Middlesex Fells, Melrose, Mass.

Hassallia byssoidea Hassall is a very variable species and is credited to South Carolina only in this country by Bornet and Flahault. A form of it, not exactly typical, grows on rocks at the water's edge along the Quinebaug River in Lisbon, Conn. It forms small tufts nearly black in color. It is characterized, as a form, by its regular, erect branches given off at an acute angle.

Desmonema Wrangelii (Ag.) B. & F. is a curious genus of the Tribe Scytonemaceae, characterized by having several filaments inclosed in a common sheath and also by having basal heterocysts. It is very abundant in Roaring Brook, a mountain rivulet in Cheshire, near New Haven, Conn. It grows upon stones and rocks in the swiftest currents and forms slippery, bluish black expansions. On being detached from the substratum it falls apart into small penicillate tufts. It is present during the month of June at least.

Nostoc parmelioides Kuetz. is one of the most readily recognized species of the genus. The frond is erect and attached at one point. It is generally strongly flattened and orbicular, with edges more or less strongly crenate. Within, the central filaments radiate from the attached portion, but the cortical filaments are convolute and twisted. It is the *N. cristatum* of Bailey and the *N. alpinum* of Wood and Wolle. Bailey found it in New York, and Wood and Wolle in Pennsylvania. The writer has it from near Harrisburg, Penn., collected by Harry M. Kelley, and has found it in abundance in brooks at Mt. Carmel, Conn.

Anabaena variabilis Kuetz., which may be distinguished from any other species of the genus occurring in this country by its oval, seriate spores remote from the heterocysts, occurred to the writer in the autumn of 1894 in the brackish pond near Watch Hill, R. I., mentioned above. There was a great abundance of it, forming a dark greenish-brown, gelatinous layer on the floating leaves of *Ruppia*. The species is new to North America.

Schizothrix lardacea (Ces.) Gomont. Of the twenty-seven species of this homocysted genus given by Gomont in his monograph, only four are credited to North America north of Mexico. *S. lardacea* was found in some abundance on dripping vertical faces of trap at East Rock, New Haven, Conn. It formed masses of a dirty brown color. It has previously been found only in Germany, France and Italy.

Sch. fragilis (Kuetz.) Gomont was found at Brookfield, Conn., forming reddish crusts on stones kept moist by the spray from a waterfall. The red color was due to a unicellular organism associated with it. Hitherto it has been credited only to Switzerland.

Hydrocoleum homoeotrichum Kuetz. The species of the genus *Hydrocoleum* are distinguished by their caespitose habit and calyptrate terminal cell. No one of the four fresh water species is credited to North America. *H. homoeotrichum*, however, was found by the writer growing in small short tufts on the posterior ends of shells of living fresh water mussels (*Anodonta*) in Trading Cove Brook, Norwich, Conn.

Symploca muralis Kuetz., collected in New England by Farlow grows also on moist soil about the public pump in East Falmouth, Mass., and what appears to be the same species occurs abundantly on flower pots in greenhouses in New Haven, Conn.

Lyngbya versicolor (Wartm.) Gomont, not credited to North

America in the "Monograph," has been found by Dr. Humphrey in Jamaica, W. I. (cf. Phyc. Bor. Am., No. 54), and by the writer at Salisbury, Conn., and in two localities near New Haven, Conn. (cf. ibid., No. 54). It grows attached at first, but later floats free.

L. Lagerheimii (Moeb.) Gomont. A very slender species distinguished by being fairly regularly twisted into a loose spiral, previously found only in Brazil, has reappeared in Southern New England. The species grows in brackish water in a small pool near Norwich, Conn., and in Little Pond, Falmouth, Mass. In each case it was growing upon *Cladophora expansa* and in one case was associated with *Scenedesmus caudatus* and various desmids, while in the other it grew with *Chara crinita* and *Gloeotrichia Pisum*. It also grows somewhere near New Haven, as considerable quantities of it appeared in an aquarium in the Biological Laboratory of the Sheffield Scientific School.

Phormidium Valderianum (Delp.) Gomont. This is another interesting species found in Watch Hill Pond, R. I. It grows in fresh water in Europe and forms expanded, lamellose strata on rocks and plants. In this locality, it forms a verdigris-green gelatinous cylindrical covering to the elongated stems of *Ruppia maritima*. It is common to find along the shore of the pond *Ruppia* stems partially dried and then the *Phormidium* layer is papery in texture.

Arthrospira Jenneri Stiz. is not credited to this country by Gomont. It is a large form and unmistakable. It has been found by Mr. Isaac Holden in some abundance near Schenectady, N. Y.

ARTHROSPIRA GOMONTIANA n. sp. For several years Mr. Isaac Holden and the writer have found in the vicinity of Bridgeport, Conn., scanty material of an *Arthrospira* which appeared to be different from any previously described. In June, 1895, however, a considerable quantity was found and sufficient material was preserved for future distribution and study.

This species makes its home in a pool of fresh water near Factory Pond in the northern part of Bridgeport, and floats upon the surface in verdigris-green patches of comparatively small size, resembling very much the so-called "Wasser blüte" of *Anabaena flos-aquae*, *Gloiotrichia Pisum*, etc. The floating masses are made up of small flocculent bits, each of which contains a considerable number of the trichomes of the *Arthrospira* held together by a common jelly.

The diameter of the trichome is from 2.5–3 μ. It is regularly twisted into a rather lax spiral, the distance between the turns being 16–18 μ, and the width of the turn about 6 μ. Caduceus forms are not uncommon. The cells of the trichome vary from 4–5 μ in length; the cell divisions in vigorous trichomes are indistinct with few granules and with the cell contents light bluish green by transmitted light. In the majority of the cells large vacuoles are present.

This form is decidedly smaller than either *A. Jenneri* or *A. Platensis* and with a laxer spiral. From *A. miniata* it differs both in habitat and habit, and in the fact that the extremities are not at all capitate. As the species appears to be new, the writer desires to dedicate it to M. Maurice Gomont, of Paris, as a token of his esteem and respect.

The writer wishes also to express his deep obligation to Dr. Bornet and M. Gomont for assistance in determining the abovementioned forms, as well as others, without which no certainty would have been possible.

Personal Nomenclature in the Myxomycetes.

By O. F. Cook.

As has been said, there are two ways of naming plants, according to the system of priority, or according to the personal system, which is no system at all. The alleged object of both methods is to secure uniformity of nomenclature, and opinion upon their relative merits depends on whether uniformity with the past is looked upon as more important than uniformity with the future. That the personal system does not always secure uniformity even with the immediate past is evidenced by two recent books, both purporting to be monographs of the same group of organisms. They are based, practically, on the same collections and are published only two years apart. Massee's "*Monograph of the Myxogastres*" recognizes 41 genera. Lister's "*Mycetozoa*" describes 38, but 13 of these are different from those of Massee. Massee has 430 species, of which nearly one-third are not recognized as valid by Lister, while another third have their names changed, so that of the 430 binomial specific names in Massee's book just 160 are to be found in Lister's. The student who would compare or make use of both works must spend much time in more or less fruitless attempts at cross-references, for the indexes are defective.

No charge of adhesion to the laws of priority can be made effective against either Massee or Lister, any more than against their great predecessor Rostafinski. The indications are that all three have believed that variety in names would add a pleasant synonymical spice to the study, with the advantage of discouraging beginners not accustomed to much seasoning of this kind.

Thus to judge from the past the personal system will not give us uniformity, for the recent works differ in nomenclature as much or more than the older. A most radical change, however, must follow any attempt at an application of the law of priority, for it will remove nearly all the names used for the last twenty years, or since the publication of the works of DeBary and Rostafinski. Nearly all the Rostafinskian generic names must be replaced by others now disused for half a century or longer. If, however, these sweeping changes will bring us at once into uniformity with all the future, the wisdom of making them is evident—the sooner the better. Apparently, however, the application of the rules through which uniformity is expected for the higher plants does not give the same promise in the case of the Myxomycetes. A large number of old generic names exist, and their authors included under them forms now recognized as belonging to several different families, for the older writers had absolutely no idea of genera as we understand them. The classification in this group is by no means settled, and the principle that a genus is a negative conception merely, and consists of what may be left under a generic name after subsequent genera are withdrawn, will bring about in the Myxomycetes the result that with changes of view on the relative importance of characters, changes in nomenclature will be necessary. To illustrate by a simple case, the genus *Physarum* was described by Persoon (1797) on four species, as follows:

Physarum columbinum=Lamproderma.
" bivalve=Angioridium, }
" viride } =Tilmadoche, } =Fuligo.
" nutans }

Thus all the original species of Physarum have at one time or another been removed from the genus, and we are brought to the alternative of dropping the old name or of preserving it by slipping it around over the different generic groups, representatives of several of which were included under most of the old names. If we adopt Lister's characterization of Fuligo we must abandon the genus Physarum in the sense in which recent authorities have used the name, for, as Lister himself states, the generic character of Fuligo depends on the presence or absence of a bell-jar over the ripening plasmodium. Physarum would then either be dropped or passed back to what is now called Lamproderma, a genus of a distinct family. What would then be the confusion if the next writer should find characters on which Fuligo, Tilmadoche and Angioridium might be held distinct?

That there will be immediate uniformity of view on the classification of the Myxomycetes is not to be expected, and if we are to have an arbitrary system of rules by which the law of priority is to be applied in nomenclature it seems that one might be made which would at least fix a generic name to a certain natural group which varying views of classification could change only in size or supposed importance. To follow a principle which may necessitate that a name be passed back and forth between different families or natural orders is to create confusion by law. To drop names based on species which represented new generic types involves a principle so manifestly unjust that continued acceptance of it is not to be expected.

One method by which both these difficulties could be forever avoided is to agree that unless the author of a genus designates a specific type in connection with his original description, the first species referred to the genus may be looked upon as the generic type, the genus to stand only if its type is found distinct from previously named genera. In the Myxomycetes this principle would probably necessitate fewer changes than either of the others. Such a simple method of settling nomenclatorial problems may be thought to smack of empiricism. Its utility and practicality cannot, however, be doubted, and it seems to be in general and growing favor among zoölogists. The only serious objection to its general application seems to be that a large number of names would be changed. Whether the subsequent stability of generic names would not entirely overbalance this objection is a question worthy of careful consideration, for if botanists are to follow arbitrary rules for the sake of uniformity in nomenclature, it is not probable that they will be satisfied until a system is framed which shall insure the uniformity.

New Species of Fungi.

By J. B. Ellis and B. M. Everhart.

I. SANDWICH ISLAND FUNGI.

Collected by Mr. A. A. Heller, in the Island of Oahu, during the summer of 1895.

Meliola Sandicensis E. & E.

Mycelium amphigenous, but mostly hypophyllous, forming suborbicular black patches 2–4 mm. diam. with a well defined outline. Mycelium abundant, with opposite spreading branches 6–7 μ thick. Capitate hyphopodia abundant, opposite, small (12–15 × 6–7 μ), short-stipitate, the upper cell ovoid or subglobose; mucronate hyphopodia very scarce, ampulliform with a short, straight neck, found occasionally standing opposite a capitate hyphopodium. Bristles abundant, both on the mycelium and surrounding the lower part of the perithecia, 300–500 μ long, 8–10 μ thick, generally with slight swellings at intervals, translucent-brown at first, finally almost opake, septate at intervals of about 40 μ, gradually attenuated above to a point. Perithecia scattered on the mycelium, subglobose, of coarse, cellular structure, papillose-roughened, 150–200 μ diam. subostiolate, finally collapsing. Asci clavate-elliptical, 50 × 25–30 μ, sessile, 2–3–4-(mostly 2-) spored. Sporidia oblong-cylindrical, 4-septate and constricted at the septa, rounded at the ends, 33–40 × 12–15 μ, brown.

The bristles are so abundant that the patches of mycelium resemble dense tufts of black hair, almost entirely hiding the perithecia. This character, with the greater length of bristles and the comparative absence of mucronate hyphopodia, with the 2–4-spored asci, distinguish this from *M. malacotricha* Speg., *M. amphitricha* Fr., and the other species having similar sporidia.

On leaves of some plant of the Family Rubiaceæ. No. 2369.

ASTERINA GLOBIFERA E. & E.

Epiphyllous. Perithecia scattered, ovate, becoming more or less depressed and collapsed, small, 100–200 μ diam., astomous, membranaceous, overrun and surrounded by an obscure mycelium, consisting of yellowish-hyaline prostrate, septate, branching threads and erect or ascending moniliform, brown threads. Perithecia at first filled with yellowish-brown, globose cells, 6–9 μ diam, among which, later on appear the obovate or subglobose asci 20–30 × 15–20 μ containing 8, elliptical hyaline spordia 15–20 × 8–10 μ composed of two globose cells with a constriction between them.

On *Grevillia* sp. No. 1946.

SCIRRHIA LOPHODERMIOIDES E. & E.

Stromata narrow-elliptical or linear, ½–2 mm., long, or by confluence ½–1 cm., long, raising and splitting the epidermis, black. Ascigerous cells globose, 150–200 μ diam., lying in a single series. Ostiola inconspicuous. Asci oblong, sessile, 80–90×20–22 μ, 8-spored. Sporidia crowded-biseriate, cylindrical, curved at the lower end (with a septum where the curve begins)? greenish-hyaline, 35–40x7–8 μ. Differs from *S. striaeformis*, Niessl., in its longer, cylindrical sporidia.

On dead culms of some grass. No. 2368.

PUCCINIA OAHUENSIS E. & E.

II. & III. Sori mostly hypophyllus, erumpent, naked, orange-yellow, pulverulent, subconfluent, not margined by epidermis. Uredospores obovate, orange-yellow, coarsely and strongly echinulate, 22–30 × 20–22 μ.

Teleutospores mixed with the uredospores, obovate-elliptical, smooth, yellow-brown, slightly constricted, darker at the apex and slightly thickened, but without any distinct papilla, 27–40 × 15–20 μ. Pedicles shorter than the spores.

Remarkable for its almost permanently yellow sori, which only become a little darker after the leaves become dead and dry. *P. Windsoriae* Schw., has spores on longer pedicels, more distinctly thickened above and scarcely constricted.

On leaves of some unknown grass (resembling *Panicum* or *Holcus*). No. 1976.

UREDO VELATA E. & E.

Sori amphigenous but mostly epiphyllous, pluvinate, scattered, orbicular, ½–1 mm. diam., mostly surrounded by a reddish-purple discoloration, covered by the epidermis which is finally ruptured in the center or cracks across, but still remains covering the sori. Spores elliptical, pale, with a thick epispore, faintly aculeolate, 22–30 × 18–20 μ. Paraphyses sparingly developed.

Differs from *U. euphorbicola* B. & C. and *U. tordillensis* Speg. in its larger spores and does not seem referable to any of the euphorbicolous species of *Uromyces* hitherto described.

On *Euphorbia cordata.* No. 2027.

PHYLLOSTICTA SCAEVOLA E. & E.

Spots orbicular, light brown, 2–3 mm. diam. Perithecia hypophyllous, innate-superficial, black, 60–80 μ diam., pierced above. Sporules clavate-oblong, 2–3–nucleate, hyaline, 10–12 × 2½–3 μ.

The perithecia in the specimens examined were mostly sterile.

On leaves of *Scaevcla Chamissoniana.* No. 2124.

HENDERSONIA NITIDA E. & E.

Perithecia epiphyllows, scattered, innate–prominent, globose, 90–110 μ diam., black and shining, perforated above, about one-half buried in the substance of the leaf. Sporules oblong, 1–3–septate, not constricted, hyaline at first, then pale brown, 12–15 × 3½–4½ μ, on slender basidia shorter than the sporules.

On living leaves of *Myrsine* sp. No. 2305.

ASCHERSONIA MARGINATA E. & E.

Stromata amphigenous, carnose, sessile, adnate, hemispherical or strongly convex, mostly narrowly marginate, 2–3 mm. diam, nearly black outside (yellow when fresh)? light-yellow within and of sclerotoid structure. Perithecia (ascigerous cells) sunk in the stroma in groups or clusters, of 4–8, minute (75–110 μ) irregular in shape from mutual pressure. Ostiola slightly prominent, soon perforated. Sporules fusoid, 2–3–nucleate, hyaline, 5–7x1½ μ, acute at each end. Basidia slender, longer than the sporules.

Differs from *A Tahitenis* Mont., and *A turbinata* Berk., in its clustered perithecia and smaller sporules.

On living leaves of *Psidium* No. 1945.

II. FLORIDA FUNGI.

Collected by Mr. Geo. V. Nash, in Florida, during the summer of 1895.

ASTERIDIUM DOTHIDEOIDES E. & E.

Perithecia epiphyllous, scattered or loosely grouped, and often 3–4 confluent, flattened-convex, 300 μ diam., or elongated and hysteriiform, 500 × 200 μ, fringed around the base with a prostrate radiating sparingly anastomosing mycelium, of brown subcontinuous threads about 5 μ thick with obovate or globose one-celled hyphopodia about 7 μ diam. at distant intervals. Asci obovate, sessile, 30–40 × 18–21 μ. Sporidia crowded, oblong-elliptical, about 20 × 7–8 μ, often slightly curved, obtuse, yellowish-hyaline and mostly uniseptate at first, finally brown and biseptate, the septa hyaline.

Very different from *A. lepidigena* E. & M. on the same host.

On leaves of *Andromeda ferruginea*. No. 1939.

SEPTORIA QUERCICOLA SACC. Mich., 1: 174; Syll. 3: 505.

Spots orbicular, 1–2 mm. diam., dirty-white with a dark margin, or ferruginous, larger and irregular. Perithecia amphigenous but more distinct above; on the white spots, mostly only one in the center of the spot; on the larger ferruginous spots, more numerous and scattered. Sporules cylindrical, curved,, subattenuate at the ends, 3-septate, 25–40 × 3, μ. Var. *cinerea* E. & E., on leaves of *Quercus cinerea*, differs only in its longer (40–60), 3–6–septate sporidia.

On *Quercus* sp. No. 2091.

DARLUCA ARCUATA E. & E.

Perithecia globose, 75–100 μ diam. Sporules arcuate-fusoid, hyaline, 3-septate, not constricted, 14–16×2½–3 μ.

Distinguished from the other species of this genus by its arcuate sporules.

Parasitic on *Uredo*, on leaves of *Andropogon*? No. 1837.

COLLETOTRICHUM COMMELINAE.

Spots dark brown, suborbicular, 2–3 mm. diam., sub-indefinite, paler and more obscure below. Acervuli about 100 μ diam., fringed with dark brown, obscurely septate hairs 4–5 μ thick below and tapering above, 60–75 μ long. Conidia oblong, hyaline continuous, 12–16×4–5 μ, a little narrower at one end.

On leaves of *Commelina angustifolia*. No. 1798.

COLLETOTRICHUM ERYTHRINAE E. & E.

Spots orbicular, rust-color, with the margin darker, ½ cm. diam. Acervuli epiphyllous, erumpent-superficial, 150–200 μ, diam. loosely clothed with simple, brown, sparingly septate hairs 70–100 × 3–4 μ. Conidia oblong–cylindrical, hyaline, continuous, 14–16 × 3½, μ.

Differs from *C. Commelinae* in its larger spots and narrower sporules.

On leaves of *Erythrina herbacea*. No. 2123.

COLLETOTRICHUM AZALEÆ E. & E.

Spots dark rusty-brown, orbicular, 3–8 mm. diam., definite, with the margin concolorous. Acervuli mostly epiphyllous, erumpent, 120-μ diam., sparingly clothed with slender, black, slightly curved, septate bristles 50–70 × 3–3½ μ. Conidia oblong, 8–13 × 3–3½ μ.

Sporules shorter than in either of the two preceding species.

On leaves of *Azalea viscosa*. No. 1991.

CERCOSPORA CASSAVAE E. & E.

Spots orbicular, light-rusty brown, 3–5 mm. diam. definite, with a narrow, darker margin. Hyphae cespitose, continuous, slightly toothed above, yellowish-hyaline, 30–40 × 4 μ. Conidia cylindrical or clavate-cylindrical, 3–5-septate, hyaline, 20–50 × 5–6 μ. Amphigenous.

On leaves of *Cassava*. No. 1950.

CERCOSPORA CHRYSOBALANI E. & E.

Spots deep red-brown, definite, mostly irregular in shape, 1–6 mm. diam. Hyphae amphigenous, cespitose, brownish, continuous, slightly narrowed and subundulate above, 20–30×3½–4 μ. Conidia, slightly narrowed above, subhyaline, 3–8–septate, 30–70-×3 μ.

On leaves of *Chrysobalanus oblongifolius*. Nos. 1949 and 1793.

CERCOSPORA GALACTIAE E. & E.

Amphigenous. Spots none. Hyphae densely tufted, 100–110-×6 μ, septate, dark-brown, subgeniculate, and subundulate above; the tufts of hyphae forming loose floccose patches ½–1¼ mm. across, scattered over the entire surface of the leaf. Conidia obclavate cylindrical, slightly colored, 2-8–septate, 30–70 × 5–6 μ.

Very distinct from *C. flagellifera* Atk., on *Galactia pilosa*.

On *Galactia Nuttallii*. No. 1987.

ISARIOPSIS PENICILLATA E. & E.

Stipe about ½ mm. high, composed of simple, pale yellow threads closely compacted at base and 10–15 μ thick, relaxed above and spreading in a brush-like manner, the fusoid yellowish-hyaline 22–25 × 5 μ (obscurely 1–3-septate)? conidia terminal on the fibers composing the stipe.

Parasitic on mycelium of *Meliola* on leaves of *Gordonia lasianthus*. No. 1956.

UREDO SCHOENOCAULI E. & E.

Sori erumpent, mostly elliptical, ½–¾ × ⅓ mm., at first covered by the epidermis, soon exposed, yellow. Spores globose

15 μ diam., oftener obovate or elliptical, 19–22×14–16 μ, slightly aculeate.

On *Schoenocaulon gracilis*. No. 2015.

III. MEXICAN FUNGI.

Collected in the vicinity of Monterey, Mexico, by Dr. B. F. G. Egeling.

SCHIZOPHYLLUM EGELINGIANUM E. & E.

Pilei imbricated, reniform, margin entire or lobed, 1½ cm. long, 2 cm. wide, white-tomentose, the margin cleft, white-pilose, depressed behind around the short lateral stem, zoneless; flesh about 1 mm. thick, white, carnose-coriaceous. Lamellae pale flesh-color, unequal, with a row of very short ones around the margin, narrow. Spores colorless, globose-elliptical, about 3 × 2½ μ, borne on clavate-cylindrical basidia, 18–20 × 3½ μ.

The pilei are borne on a white, subcoriaceous subiculum erumpent through the epidermis in patches 3–4 mm. across, often becoming confluent for 1–8 cm. in extent and nearly surrounding the stem.

On dead, hollow stem of *Magnolia Mexicana*, June, 1895.

ROSELLINIA POLIOSA E. & E.

Perithecia hemispheric-prominent, 1¾–2 mm, diam., covered by a thin, ashen-gray coating, which also overspreads the surface of the wood, and may be only accidental. Ostiolum papilliform. Asci cylindrical, 150–200×13–16 μ, (paraphysate) ?, 8-spored. Sporidia broad oblong-fusoid, brown, finally nearly opake, but when young the extremities are paler, 25–35×12–15 μ.

On dead wood. June, 1895.

DIDYMOSPHAERIA SPHAEROPHORA E. & E.

Perithecia scattered, buried, 1 mm. diam., finally more or less distinctly collapsing, leaving the erumpent apex and broad papilliform ostiolum prominent in the center of the depression. Asci cylindrical, stipitate, paraphysate, 8-spored, p. sp. 100–110×10–12 μ. Sporidia uniseriate, oblong, uniseptate, dark brown, constricted, more or less distinctly roughened, 16–20×6–8 μ. with a depressed-globose, yellowish-hyaline appendage at each end.

Differs from *D. appendiculosa* Speg. in its larger perithecia, smaller asci and sporidia, and the different character of the appendages.

On *Agave* sp.

PHYLLACHORA? YUCCAE E. & E.

Stromata gregarious, elliptical or oblong, ½–1½ × ½ mm., subseriate, sunk in the substance of the leaf, and covered above by the blackened epidermis. Ascigerous cells 80–90 μ diam., finally confluent. Asci oblong-cylindrical, narrowed above, aparaphysate, 50–60 × 7–8 μ, filled with granular matter and oil-globules. Sporidia not yet formed.

On *Yucca angustifolia*. June, 1895.

HAPLOSPORELLA MEXICANA E. & E.

Stromata numerous, purplish-black, erumpent, subseriate, often confluent for 1 or more cm. and 2–3 mm. broad, entirely covered at first, soon visible through cracks in the ruptured epidermis, of soft, carnose texture, flat-pulvinate, the mycelium blackening the inner substance of the stem. Perithecia (ascigerous cells)? closely packed, 190–230 μ. diam., becoming subconfluent. Sporules obovate at first, and hyaline, finally brown and mostly elliptical, 15–22×11–13 μ., on stout basidia mostly shorter than the sporules.

On account of the carnose stroma this should perhaps be referred to the genus *Aschersonia* in the Fam. Nectrioideae, but the sporules and the dark color would make it *Haplosporella*.

On dead stem of *Magnolia Mexicana*. June, 1895.

MELOGRAMMA EGELINGII E. & E.

Stroma subcuticular, 1–2 mm. diam., ovate, the apex erumpent, substance white, granular and finally crumbling. Perithecia (14–20), peripherical, ovate, 200 μ high, 150 μ broad, black, immersed in the surface of the stroma which finally crumbles away, leaving them partially free, narrowed above into an acute ostiolum, which is finally perforated and obtuse. Asci clavate-cylindrical, short-stipitate, paraphysate, p. sp. 75–85 × 12 μ. Sporidia biseriate, cylindrical, obtusely rounded at the ends, 5-septate and more or less constricted at the septa, one cell near the middle generally swollen, yellow-brown, becoming opake, 20–23 × 6 μ.

On dead leaves of *Agave*. May, 1893.

Proceedings of the Club.

TUESDAY EVENING, OCTOBER 8TH, 1895.

The President in the chair and 27 persons present.

Prof. Arthur M. Edwards, M. D., Mrs. C. Rice and Mr. Charles Ericson were elected active members.

A communication was received from the Secretary of the Council of the Scientific Alliance, announcing the opinion of the Council that it would be advantageous for the secretaries of the societies forming the Alliance to transmit abstracts of the proceedings for publication in *Science*. Upon motion of Dr. Allen, it was unanimously resolved that the Club concur in the above opinion.

Dr. T. F. Allen reported a visit to the islands lying near Lands End, and spoke of the peculiarly equable climate, and its effects upon the flora and productions. He had found Hooker's British Flora an unsatisfactory book for field work.

Mr. Lighthipe spoke of his observations in the pine barrens, especially with reference to *Schizaea* and *Chrysopsis*.

Dr. Small exhibited a map upon the blackboard, indicating his travels in Georgia in securing a forestry exhibit for the Atlanta exposition. He also briefly described the form of the exhibit, which was in duplicate. He promised a farther report at a subsequent meeting.

Dr. Britton announced collecting *Panicum colonum* L., a tropical species related to *P. Crus-galli*, in Virginia, and the discovery of a large patch of *P. verrucosum* on Staten Island by Mr. Tyler. He also announced that the organization and actual commencement of work on the New York Botanical Garden had taken place.

Brief remarks were also made by Miss Ingersoll and Messrs. Tyler, Van Brunt and Van Sickle. Mr. Van Sickle referred particularly to the occurrence of the Russian Thistle in northern Jersey and of *Azolla Caroliniana* at Passaic.

The President reported upon his observations upon the western slope of the Catskills, a few miles from the locality of the old Mountain House, speaking particularly of a white flowered form of *Impatiens aurea*. He brought a number of sets of some of his more interesting collections which were distributed among the members.

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Brotherus, V. F. Beiträge zur Kenntniss der brasilianischen Moosflora. Hedwigia, **34**: 117–131. 19 Je. 1895.

Describes new species in *Ephemerum*, *Systegium*, *Trematodon*, *Leucobryum*, *Octoblepharum*, *Fissidens*, *Syrrhopodon*, *Calymperes*, *Pottia*, *Hyophila*, *Barbula*, *Macromitrium*, *Tayloria*, *Physcomitrium*, *Bryum*, *Garovaglia*, *Sigmatella* and *Sphagnum*.

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* At the Springfield meeting of the American Association for the Advancement of Science, the Section of Botany adopted the following limitations of the contents of this Bibliography:

1. That all bacteriological, horticultural and agricultural titles be omitted, but in any case of doubt the title is to be included.

2. That all references to exsiccatae be excluded.

3. That all references to reviews be excluded.

The Bibliography Committee and the Editors of the BULLETIN would renew their request that omissions from this record be communicated.

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Note on the distribution of *Sisymbrium altissimum.*

Ellis, J. B., and **Everhart, B. M.** New Fungi, mostly Uredineae and Ustilagineae from various Localities, and a new *Fomes* from Alaska. Bull. Torr. Bot. Club, **22**: 362–364. 31 Au. 1895.

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Hedwig. Theoria generationis and Hist. Nat. Muscorum. 4°.
Lamarck and DeCandolle. Flore Francaise. 6 vols., 8°.
Steudel. Nomenclator Botanicus. 8°, board.
Linnaeus. Flora Suecica. First Edition.
Leers. Flora Herbornensis. 16 pl., 8°.
Acharius. Synopsis Lichenum.
Marsilius. Dissert: de generatione Fungorum.
Vaillant. Botanicon Parisiense. Folio.
Queckett. Histological Catalogue. 4°. 2 vols., cloth.
Luerssen. Medico-Pharmaceutik Botanik. Vol. 1, Kryptogamen, 8°, paper.
Lindley, Dr. Flora Medica. 1 vol., cloth.
Waring, Dr. Pharmacopaeia of India. 8°, cloth.
Fluckiger, Dr., and Hanbury, D. Pharmacographia. 8°.
Hanbury, D. Notes on Chinese Materia Medica.
Hanbury, D. Science Papers. 1 vol., 8°.
Waring, Dr. Bibliotheca Therapeutica. 2 vols., 8°.
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Farlow, W. G. Marine Algae of New England. 8°, paper.
Toni and Levi. Flora Algologica Venezia. Parts I. and III.
Underwood. Catalogue of N. Am. Hepaticae. 8°.
Tuckerman. Synopsis of Lichens of New England.
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Queckett, J. Lectures on Histology. 2 vols., 8°, cloth.
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Botanical Tracts, chiefly Cryptogamia, many vols. requiring separate list.

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Many other works, specially on Fungi, not enumerated here.

In applying for details of price, etc., quote the headings here written.

LONDON, July, 1895.

Contributions from the Herbarium of Columbia College.

[The numbers omitted from this list are out of print.]

VOLUME I.

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... 25 cents.

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BULLETIN

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TORREY BOTANICAL CLUB.

Vol. 22. Lancaster, Pa., November 30, 1895. No. 11.

Contribution to American Bryology—XI.

By Elizabeth G. Britton.

1. COSCINODON RAUI AND COSCINODON RENAULDI.

(Plate 248.)

Owing to the fact that the upper part of the leaf in *Coscinodon* is colorless, it has happened that in the first descriptions of both *C. Wrightii* and *C. Raui*, the vein has been described as ending below the apex. In describing *C. Wrightii* Sullivant said of the leaf that it was "costate half way" (Mosses U. S. 38. *pl. 4.* 1856). In the Icones (71. *pl. 45.* 1864), he corrected this mistake, figuring the vein extending into and forming the awn.

Austin made the same mistake about *C. Raui* (Bull. Torr. Bot. Club, **6**: 46. 1875), describing the leaf with the vein ending below the apex, "costa valida sub apice finienti," yet in the type specimens preserved in his herbarium at Columbia College, the vein is clearly excurrent, forming a terete, white awn, most clearly seen in old abraded leaves when the blade is torn away. He recognized its true character in *C. Wrightii*, for he says of it "costa extending into the much longer, more terete and more scabrous hair point;" yet he failed to see it in his own species. This is the more remarkable, as he had in his herbarium an original sketch of the leaves by E. A. Rau, on the margin of which Mr. Rau had written, "Leaves throughout chlorophyllose, except the long excurrent costa or tip."

In the Manual (L. & J. Mosses of N. Am. 155, 1884) this mistake is repeated and in describing *C. Renauldi* (Bot. Gaz. 15; 41. 1890) M. Cardot cites this as one of the points of difference between these two species, the other being a difference in the teeth. These are described in the Manual as " entire, split or merely perforated here and there on the line of division, erect when moist, open when dry." This is a translation from Austin's original Latin description, but it does not agree with all his specimens. The teeth are very fragile in his species, and are seldom seen entire and unbroken, except on a freshly opened capsule. They are long and slender, perforate at base, three to four parted above, and densely papillose; later they divide into slender divisions, and on old capsules have disappeared altogether, leaving only the annulus. As compared with the figures of *C. Renauldi*, they differ only in not being truncate when perfect. From *C. Wrightii*, as figured in the Icones, these teeth are much longer, more acuminate, the divisions narrower, more slender and regular, the perforations almost continuous above, and splitting into three to four slender divisions to each tooth. The annulus also is not like the mosaic of flat cells figured by Sullivant, there are only two rows of cells instead of three, and the last row has elongated vesicular cells. In the description of *C. Renauldi*, the annulus is not mentioned, nor is it figured in the plate. We have not seen a capsule of this species, but in a recent letter M. Cardot states that the annulus is present, but that he has not been able to determine whether it is persistent or fugacious as all the capsules which he has examined were too young. In the plate the teeth are figured as truncate. M. Cardot says that they were taken from freshly opened capsules, but we are of the opinion that if he were to search in the apex of the lid he would find the remnants of those teeth, as we have found in *C. Raui*, that the tips often fall with the lid, and it was with difficulty that we secured a mount sufficiently perfect for our drawing.

In the description of *C. Renauldi*, M. Cardot states that he has not seen authentic specimens of *C. Raui*, Aust., but this is a mistake, for the specimens I sent him were from Austin's herbarium, labelled Austin by "*Grimmia Raui*, Colorado, Mrs. Roy," and were probably from the same collection as those in the herbarium of E. A. Rau, collected by Brandegee sent by Mr. Rau. These are the specimens cited by Cardot under *C. Renauldi*, and seem to prove conclusively that the two species are the same.

The specimens collected by J. M. Holzinger on exposed sand bluffs at Winona, Minnesota, have been determined by M. Cardot as *C. Renauldi*, and by me as *C. Raui*. We also have specimens collected by Mrs. T. A. Williams at Rapid City, South Dakota, which we have referred to this species.

The plate of *C. Raui* is taken from type specimens in Austin's herbarium sent to him by E. A. Rau, collected by Brandegee.

Description of Plate 248.

1. Plants natural size; 2. one enlarged; 3. antheridial branch; 4. archegonia branch with the calyptra partially exserted; 5, 6, 7. outlines of leaves; 8. antheridia and bracts; 9. basal half of leaf; 10. apex, showing long rough awn; 11. calyptra; 12. capsule with lid; 13. capsule without lid; 14. old capsule with fragments of teeth; 15. two teeth; 16. annulus; 17. spores.

2. DICRANELLA HETEROMALLA AND ITS VARIETIES.

(PLATE 249.)

According to European authorities this is a very variable species, several of its more striking varieties having received names. The typical form seems to be according to Schimper and Limpricht, the one having the pedicels erect but more or less sinuous. Braithwaite, however, states that the pedicels may be curved, and Boulay says that owing to the variability of the flexion of the pedicel at its summit the capsule assumes very diverse attitudes.

Several of the European varieties have been recognized and distributed in American exsiccatae; but we have been surprised to find that even in this common species there still remain some points to be cleared up, and possibly two allied species to be erased from our lists.

The common lowland form ranging along the Atlantic plain from Newfoundland to Florida, west to Dakota, which grows abundantly along sandy roads in dense cushions at the roots of trees and on dry banks, seems to be typical, having the seta erect, flexuose and glossy yellow, agreeing with European specimens and exsiccatae. It was distributed in Drummond's Mosses, 2d

Ed. No. 54, in Sulliv. & Lesq. Musci Bor. Am. No. 67, and Austin Musci App. No. 79.

DICRANELLA HETEROMALLA ORTHOCARPA (Hedw.).

Dicranum orthocarpum Hedw. Sp. Musc. 131. *pl. 30.* 1801.

Dicranella Fitzgeraldi Ren. & Card. Bot. Gaz. 13: 197. *pl. 13.* 1888.

This variety is not recognized as distinct by Limpricht, but is given as a synonym of the species, into which it merges insensibly, having the same range. The type locality was at Lancaster, Pennsylvania, but we have not seen the type specimens. The capsule, as the name implies, is not only erect but straight, in the most depauperate forms being so small and black as to suggest *Ditrichum tortile.* This is true of the specimens distributed in Drummond's Southern Mosses as No. 53, and in the original specimens of *D. Fitzgeraldi,* from Florida, as described and figured in the Gazette. M. Cardot has sent us four of these typical specimens; all are old and deoperculate, and represent, in our opinion, a very depauperate state of this variety. Quite recently we have received No. 156 of Ren. & Cardot Musci Am. Sept. collected by J. M. Holzinger at Rock Creek, near Washington, D. C. These specimens are in fine condition, and contradict the original description of *D. Fitzgeraldi* in several points, the old capsules when deoperculate being contracted below the mouth, which is slightly oblique; the walls also are often sulcate, so that we have no hesitation in saying that these are *D. heteromalla* var. *orthocarpa.* They agree with Sull. & Lesq. Musci Bor. Am. No. 68, and Austin Musci Ap. No. 80.

The variety *interrupta* Schimp. has also been recognized and distributed in American exsiccatae, and the var. *stricta* occurs abundantly on decomposing sandstone rocks in the Dells of the Wisconsin. Recently I have made the acquaintance of what may be called the mountain form of this species (Plate 249) for which we have not yet discovered a name, but which we think has been figuring in the Manual as *D. curvata.* It first puzzled me by growing in the dense mats of *Campylopus Virginicus* Aust., raising false hopes that it might be the fruit of this species, which has thus far only been collected sterile. The pedicels were strongly recurved, and the capsules when fresh, ovoid and smooth; but when dried they changed to the characteristic cinnamon color of *Dicranella heteromalla*, with its twisted mouth and sulcate walls, and the pedicels became erect. These specimens grew at an elevation of 5678 ft. on the summit of White Top, Virginia, on rocky ledges in shade, and were in young fruiting stage on June 26, 1892. Later in the same year, September 29th, I collected a few small plants in the trail up Mt. Marcy, in the Adirondack Mountains, New York. These also were small plants, with plump, ovoid, green capsules and yellow curved seta. But when dried the pedicels became erect, the capsules turned yellow, and showed unmistakably that they were only *Dicranella heteromalla*. It was also found at other points in the vicinity, usually in shade under or on the roots of trees in steep, sloping paths, often in very damp, black soil. Along the roadside, near the Lodge, the pedicels were seldom recurved, though the plants were small. In 1894 the form with recurved pedicels was very abundant both on Mt. Marcy and Mt. McIntyre, and formed large patches at considerable elevation on both these mountains. I had also collected it near Stowe, Vermont, in 1884, and been puzzled by the straightening of the pedicel in drying. In 1893 it was found growing with *Dicranodontium longirostre* on shady sandstone ledges of the Wisconsin Dells, and it surprised me to learn from Dr. Barnes that it was the common form of *Dicranella heteromalla* in that vicinity. It has recently been sent to me by D. A. Burnett, collected in the mountains of Pennsylvania on sandstone rocks at Bradford, associated with *Dicranodontium longirostre*, and it was collected in similar habitat and the same association by Mr. D. A. Hopkins in West Virginia. We also have specimens collected by F. L. Harvey in Maine, by Edwin Faxon on the bridle path at 3,500 feet elevation and on the summit of Mt. Lafayette; also from the Lake of the Clouds on Mt. Washington. Pringle collected it on Mt. Mansfield, Vermont, and A. C. Waghorne in Newfoundland. I find three specimens collected by Austin in 1872 in the White Mountains, which had been sent to T. P. James for determination; accompanying them is an autograph slip from James stating that they "must be a *Dicranum*, but I do not make it *subulatum*."

Now it is a curious fact that *Dicranella curvata*, though reported from two stations in North America, does not occur in any

North American herbarium, as far as we can determine. We have searched diligently for it both in the field and in several collections, and have come to the conclusion that this mountain form of *D. heteromalla* with curved pedicels has been mistaken for it.

It is recorded in the Manual from two localities only:

"On sandstone rocks, Lancaster, Pennsylvania (T. C. Porter), and from the White Mountains (James). Very rare."

Dr. Porter very kindly sent us a bit of his specimen, and it does not match European specimens of *D. curvata*. It seems referable to depauperate specimens of *D. heteromalla* var. *orthocarpa*. The White Mountain specimens cited have not been found in the herbarium of T. P. James. Macoun does not record it from any locality in Canada, nor have we any other record of its having been collected by anyone else.

3. NOTES ON THE GENUS LEERSIA, HEDW.

Leersia Hedw. Fund. Musc. **2**: 88. 1782.

Encalypta Schreb. Gen. **2**: 759. 1791.

This genus is much in need of revision, but we have not been able to take the time to do more than set right two or three glaring mistakes which have come to our notice, in studying the Eastern species, and to call attention to collectors in our Western and Northern States to the importance of securing good and abundant specimens.

There are five species known to occur in the eastern part of the continent, *L. extinctoria* (*E. vulgaris*) *L. laciniata* (*E. ciliata*) *L. rhabdocarpa*, *L. procera* and *L. contorta* (*E. streptocarpa*). One of the Eastern species *L. rhabdocarpa* has been found in Quebec, but not yet credited to the United States, it is hoped that it will be found in the mountains of New England if attention is called to the genus.

Of the additions in Macoun's catalogue, *E. subspathulata*, *E. leiomitra*, *E. leiocarpa* and *E. cucullata* are from British Columbia, or Athabasca, and although Prof. Macoun has generously furnished us with all his collection of this genus, and allowed us to keep duplicates, yet we have not felt warranted in taking the time at present to compare the specimens carefully. We have thought it very important, however, to correct Kindberg's confusing remarks regarding *E. Macounii* Aust. and *E. ciliata* Hedw.

ENCALYPTA MACOUNII AUST. Bot. Gaz. **2**: 97. 1877. L. & J. Man. 182, 1884. Macoun's Cat. **6**: 94-95 only in part (1892).

The type of this species is preserved in Austin's Herbarium at Columbia College. The specimens are abundant though immature. They have been compared with the original description, which is copied in Lesquereux and James Manual. All the statements but one have been verified; the seta is described as "minutely papillose, rather densely so above the middle." They have been examined with a magnification of 330 diameters, and out of a dozen pedicels on none of them has been found a trace of roughness.

Austin compared it to *E. affinis* Hedw. (*E. apophysata*, N. & H.). We have also made the same comparison with No. 816 of Rabenhorst's Bryotheca Europaea, and find that Austin was right. The calyptra agrees exactly in having pale irregular papillae to the fringed base, though we should call it rather minutely scabrous than "densely papillose." But the leaf characters are also very plain, the margins being strongly revolute, the vein ending below the apex, and very rough on the back with double papillae; the basal cells are clear with the short transverse walls, yellow and thickened into ridges and also papillose. This is true also of *E. affinis*, but the vein in that species is excurrent into an awn. The peristome is described by Austin as "single, the teeth of medium length, very narrow and filiform, red, more or less split into two equal segments, nodulose and granulose." This agrees with the figures of *E. apophysata* in the Bryologia Europaea, but Limpricht says the peristome is double and has a short basal membrane, one-third the length of the teeth, which he figures as 247, page 118. We have been able to detect this in No. 816 of Rab. Byoth. Eu. even when the peristome is old, but not in Austin's specimens. This would add another distinction between *E. apophysata* and *E. Macounii*, though they are evidently closely allied.

The type locality is "On rocks, Stewart's Lake Mountain, B. C., collected by Macoun, June 21, 1875.

On consulting Macoun's Catalogue, I find this locality is not given the first place as it should be, and that the specimens sent by me from Mount Mackay and Kakabeka Falls, named *E. ciliata*, duplicates of which I have in my herbarium, are also referred to this species. I have re-examined them lately, and still insist that the name I originally gave them is correct. Number 133 of Macoun's Canadian Mosses was distributed as *E. Macounii*, collected "on rocks at Wellington Mine," Vancouver Island, by Macoun. These specimens in our set prove to be *Encalypta vulgaris* var. *pilifera*. If these are the specimens on which Kindberg bases his remarks, it is not surprising that he could not find the characters indicated by Austin.

Under the heading of *E. ciliata* he says (Macoun Cat. **6**: 94):

"*Encalypta ciliata* Hedw. and *E. Macounii* Aust. are very difficult to distinguish apart. The descriptions of the best authors are also not consistent." He then quotes from them to show that the position of the teeth does not agree in all the descriptions. From this he says: "It is probable that the authors are confounding both species, also occurring in Europe. *E. ciliata* is principally found in the lower mountain districts. *E. Macounii* seems to be an alpine species also collected by Kindberg in the Norwegian Alps and considered a new species, *E. borealis* Kindb. Laubm. Schwed. & Norweg., but exactly agreeing with the original specimens of *E. Macounii* sent by Prof. Macoun."

It is interesting to know what Norwegian bryologists think about this, and we would refer to the remarks by Chr. Kaurin in the Bot. Centbl. **41**: 358 (1890). He states that in the contribution referred to by Kindberg the specimens which were called *Encalypta Macounii* are found to differ from the portion of the type which I sent him.

To continue the quotation from Macoun's Catalogue, page 95:

"The description made by Austin, cited by Lesq. & James, is, however, not completely exact; 'calyptra densely papillose, pedicel reddish, papillose, the leaves muticous;' such characters are not to be found, the calyptra and the yellow pedicel are nearly as smooth as in the true *E. ciliata*, to which the descriptions of the peristome by Schimper and Braithwaite probably belong. The descriptions by Lesq. & James and Boulay could partly be referred to *E. Macounii*, although all authors agree that in the description of *E. ciliata*, 'without a distinct collum;' *E. Macounii* has a distinct collum and the margins of the leaves distinctly reflexed. I possess no specimens of the true *E. ciliata* from North America. It may not occur there."

Now it seems evident from all this that Macoun has sent Kindberg a specimen of *Encalypta* closely allied to *E. ciliata*, wrongly named *E. Macounii*, and from this false premise he has arrived at the above conclusions. Whether all the specimens cited in Macoun's Catalogue as *E. Macounii* were sent to Kindberg is not clear, but probably this is not the case. It is likely that only a few of them were, and that the rest have been transferred without examination by Prof. Macoun in making up the list.

We note one that was not transferred, for No. 132 Canadian Mosses is cited under *E. ciliata*, with the label locality reading: "Crevices of rocks, common from Ottawa westward." These specimens have been examined and compared with the types of *E. Macounii.* They are quite distinct in the excurrent vein, plane margins, smooth calyptra, and the mouth bordered by 5–6 rows of hexagonal cells projecting above the base of the teeth. We have also examined all the other specimens in Austin's herbarium sent to him by Macoun and named by Austin *E. ciliata.* These include specimens collected at Stewart's Lake, date and locality the same as type of *E. Macounii*, but distinctly *E. ciliata;* also those from Lake Athabasca, August 29, 1875; Cascades, May 17, 1875; and Hastings county, August, 1874. All of these agree with the characters of *E. ciliata* as described by Limpricht, even to the size of the spores, but in many cases it is difficult to distinguish the preperistome as described by him. The deep projecting border of the mouth is quite distinct, as well as the scattered stomata, with the surrounding cells not differentiated, but long and thickened longitudinally. The neck also is short, but always distinct, and sometimes stomatose, though usually the stomata are above the base of the sporesac.

ENCALYPTA CILIATA (Hedw.) Hoffm.

We find in the Jaeger Herbarium all the exsiccatae cited by Limpricht, and have critically compared No. 19 of his Bryotheca Silesiaca, with our specimens of Macoun's Canadian Mosses No. 132. and Sull. & Lesq. Musci bor. Am. No. 165, Ed. 2. We find they agree in all the characters described, with a certain amount of variation in the length of the awn, and the vein which is also sometimes serrulate on the back for a short distance below the apex of the leaf; the margins are more or less undulate and slightly revolute below, erose papillose above, and the basal cells are clear and smooth, with the short transverse walls often brown but not projecting. The seta varies somewhat in length, but is smooth and yellow, often red at the junction with the capsule; there is a distinct neck measuring .2 mm., that is the sporesac does not reach the base of the capsule, the stomata are scattered above its base, and the cells of the walls are long and thickened, but not radiating around the stomata; those of the mouth are shorter and hexagonal in 5–6 rows, and project above the base of the orange-red teeth, the last rows falling in fragments with the lid. The beak of the lid is shorter than the capsule, 1–1.5 mm. and the calyptra is fringed at base and generally entirely smooth, though occasionally scabrous at apex. The peristome is erect when dry, and strongly incurved when moist; the teeth are composed of 5–7 joints, and are paler and smoother at apex. Limpricht describes a " preperistome of 32 isolated, smaller, brownish-red plates half the length of the teeth, falling off, or occasionally lacking." We have had great difficulty in distinguishing these plates, both in our specimens and the Europeon ones, but find the teeth are irregularly papillose, that is some joints will be and others not, especially the upper ones, which are generally lighter colored, and presume that is only under very favorable circumstances, on fresh young teeth, that the preperistome can be seen. The Bryologia Europaea indicates this in figures 14 and 15, as well as a certain amount of irregularity in the teeth which we have also observed. The spores are quite alike in American and European specimens, in size and the peculiar lines due to shrinking which give them the aspect of a rose-cut diamond with a flat central facet and six radiating around it.

If there are two species mixed under *Encalypta ciliata*, as Kindberg seem to think, we have not yet been able to detect it in American specimens, as compared with authenticated European ones. It has been distributed as Drummond's No. 50 pp. " Rocks and banks along the Mountains," mixed with *E. rhabdocarpa* in Sull. & Lesq. Musci Bor. Am. Ed. 2, No. 165, in Austin's Musci App. No. 174 (1870) and Macoun's Canadian Mosses No. 132. It ranges in the Eastern States from the mountains of New York and New England to Illinois, Wisconsin and Minnesota, Ontario, Quebec, New Brunswick, and north to Greenland. In the

Rocky Mountains from New Mexico to Idaho, also in California, Oregon and Washington, through British Columbia, to Behring sea.

Var. *microstoma* (Bals. & DeNot.) Sch. Br. Eu. Index, p. 7. 1855. *Encalypta microstoma* Bals. & DeNot. Pugill. No. 18. 1836.

We received from the Department of Agriculture specimens collected by Wolf and Rothrock in Colorado, 1873, which agree with the description given by Limpricht of this variety in the short seta, small capsule, with a small mouth, short teeth, lacking on some of the capsules, and the cells of the walls broader and much thickened, with very distinct stomata. The spores, however, seem to be smooth as in the species.

ENCALYPTA LONGIPES Mitt. Journ. Linn. Soc. **8**: 29. 1865.

We quote the original description:

Dioica? caule brevi ramoso, foliis patentis concavis ambitulate ellipticis acutis paulo supra basin angustatis nervo percurrento obtuse carinatis, margine minute eroso, cellulis basi infima oblongis hyalinis inde viridibus mox abbreviatis quadrato-rotundatis papillosis, perichaetialibus parvis vaginulam vix superantibus latissime ovatis acutis theca in pedunculo longissimo rubro ovato-cylindracea basi apophysata, operculo subulato subaequilongo-peristomo dentibus angustis elongatis, calyptra basi nuda apice laevi."

"Seta an inch and a half long, slightly flexuose. Capsule too immature to show if it is furrowed."

Lesquereux and James, in their Manual, on page 183, say in a foot note:

"Upon examination of the specimens of *E. longipes* Mitt. in all of Drummond's sets the characters have been found identical with those of *E. procera;* the plants monoecious; the calyptra papillose, its borders emarginate, erose or fimbriate at base; perichaetial leaves piliferous; capsule spirally striate, etc. The differences that appear in the characters indicated by Mitten result from the unripeness of the specimens he had for examination."

We were permitted by Dr. Watson to examine the type of this species at the time that Mitten's types were still at Cambridge, and we have compared them with the original description and with the above remarks. We can corroborate Mitten's statements, with additional evidence that this is not the same species as *E. procera.*

The calyptra is smooth throughout, and so is the vein of the narrow leaf, which, moreover, as the description says, has a minutely erose margin, formed of projecting cells which appear smooth, not densely papillose as in *E. procera.* The upper cells of the leaf, in fact, are not papillose but mamillate, projecting on both surfaces of the apex of the leaf, but slightly. Not only is the peristome also described as simple, but a drawing is preserved with the type, showing a single row of teeth, with 2–3 appendiculate basal segments. Kindberg in Macoun's Catalogue says that he too has seen authentic specimens of Drummond's in the collection of Dr. C. Mueller, and states that the "costa is very rough, the calyptra regularly laciniate, very rough and subspinulose above."

It is evident from these remarks, however, that the specimens could not have been authentic, for this is a direct contradiction of the original description, verified by a reëxamination of the type specimen.

We do not like to venture an opinion without careful comparisons, especially as this species is so meagrely represented in the type, which is also immature, so that it is rather unsatisfactory for purposes of comparison; yet it seems to be very closely related to *E. leiomitra* Kindb., belonging to the group of *E. rhabdocarpa* Schwaeg., from which it differs presumably in its smooth capsule (?), although the original description states that the specimens are too young to show this character.

Two undescribed Species of Rhynchosia.

BY ANNA MURRAY VAIL.

✓RHYNCHOSIA MICHAUXII.

Perennial. Stems prostrate 6–9 dm. or more long, twining above, angled, channelled, clothed, especially on the angles, with a short matted pubescence; stipules 2–5 mm. long, ovate-lanceolate, spreading, persistent; petioles angled, striate, pubescent, 2–4 cm. long, leaves 2.5–5 cm. long, depressed orbicular, much dilated, broader than long, obtuse, sometimes obscurely mucronulate, rugose and minutely hirsute above, sparingly resinous-dotted, reticulated and softly hirsute beneath; the upper ones rarely 3-foliolate with obtuse obliquely sub-orbicular lateral leaflets; racemes 1–several flowered; peduncles 1–2.5 cm. long, angled; calyx 1–1.5 cm. long, pubescent, resinous-dotted, the oblong-lanceolate acuminate lobes conspicuously foliaceous; corolla pale yellow; vexillum minutely pubescent above; legume about 1.4 cm. long, 6 mm. broad, obliquely acute, seed 2–5 mm. in diameter, red-brown. March–September.

Dry pine barrens, Florida.

Charlotte Harbor, Blodgett; Tampa, A. H. Curtiss, No. 659; DeLand, Hulst; Sanford, Lake Co., G. V. Nash, No. 2314, in Herb. Columbia College.

A species with the leaf-form of *R. simplicifolia*, but the habit of *R. menispermoidea*. It has passed under the above names and also under that of *R. tomentosa* var. *volubilis*, but is very distinct from all forms of the type of the latter species. The lateral leaflets of *R. tomentosa* are always acutish, those of *R. Michauxii* being obtuse and rounded. The leaves are largerthan those of *R. menispermoidea*, less conspicuously veined, and apparently never cordate, the flowers more numerous, the calyx larger and more distinctly foliaceous.

RHYNCHOSIA TORREYI.

Rhynchosia latifolia β Torr. & Gray, Fl. N. Am. **1**: 285. 1838.

Perennial. Stems slender, branched, prostrate, spreading and and possibly twining, angled, obscurely striate, minutely pubescent; stipules 4–6 mm. long, lanceolate, slender, caducous; petioles angled, channelled, minutely pubescent, 3–5 cm. long; leaves 6–10 cm. long, 3-foliolate; leaflets 2.5–3.5 cm. long, orbicular-obovate or oblong-obovate, obtuse with a short abrupt acumination, narrowed at the base, minutely and sparingly pubescent on both surfaces, or nearly glabrous, beset with scattered resinous dots beneath, the terminal ones larger, the others inequilateral; racemes 5–8 cm. long, slender, the flowers scattered; flowers about 1 cm. long; calyx 8–10 mm. long, pubescent, resinous-dotted, the upper lobe 2-toothed, the middle lower one slightly the longest; vexillum nearly orbicular, 8 mm. long, pubescent along the top on the outer surface, with a very small crescent shaped callosity above the claw. Legume not seen.

ORIGINAL LOCALITY. Sand Hill, Texas, Leavenworth. Type in Herb. Columbia College.

Flora of Richmond Co., N. Y. Additions and new Localities, 1891–1895.

APPENDIX, NO. 7.

Ranunculus Pennsylvanicus L. New Dorp, A. A. Tyler.

Aquilegia Canadensis L. Tottenville and Richmond Valley, Wm. T. Davis and G. H. Pepper.

Nymphaea rubrodisca (Morong) Greene. Bull's Head, J. V. Leng.

Roripa sylvestris (L.) Bess. Sailors' Snug Harbor, Dr. F. Hollick.

Silene nutans L. Arrochar, W. C. Kerr.

Silene vulgaris (Moench) Garcke. Tottenville, W. T. Davis.

Tilia Americana L. Willow Brook and New Springville, W. T. Davis.

Acer Saccharum Marsh. Moravian Cemetery and New Springville, Wm. T. Davis.

Acer platanoides L. New Brighton and Todt Hill, Wm. T. Davis.

Acer Negundo L. Port Richmond.

Medicago sativa L. New Brighton, W. T. Davis; Princes' Bay.

Coronilla varia L. Tottenville, W. T. Davis.

Ulex Europaeus L. Ward's Hill, Tompkinsville, Dr. F. Hollick. (A single plant which has persisted for several years).

Amorpha fruticosa L. Egbertville, W. T. Davis.

Phaseolus polystachyus (L.) B.S.P. Egbertville, W. T. Davis.

Opulaster opulifolius (L.) Kuntze. Todt Hill, W. T. Davis; Willow Brook (some undoubtedly seedlings).

Rubus odoratus L. Todt Hill, W. T. Davis.

Crataegus coccinea L. Karle's Neck, W. T. Davis.

Crataegus punctata Jacq. West New Brighton.

Agrimonia mollis (T. & G.) Britton, and *Agrimonia striata* Michx., replace *A. Eupatoria* L. in our catalogue.

Valeriana officinalis L. Gifford's Lane (Replaces *V. sylvatica* Banks, in our catalogue).

Onagra Oakesiana (Gray) Britton. New Dorp.

Æthusa Cynapium L. Streets of New Brighton, W. T. Davis.

Anthriscus vulgaris (L.) Hoffm. New Dorp.

Philadelphus coronarius L. Todt Hill, W. T. Davis (apparently established from old garden waste).

Solidago Elliottii T. & G. Garrettsons and New Dorp.

Solidago patula Muhl. Garrettsons and Richmond, W. T. Davis.

Gnaphalium purpureum L. Egbertville.

Tussilago Farfara L. Garrettsons.

Liatris spicata (L.) Nutt. Mariners' Harbor, W. T. Davis.

Sericocarpus linifolius (L.) B.S.P. Watchogue, W. T. Davis.

Centaurea nigra L. Moravian Cemetery.

Onopordon Acanthium L. Sailors' Snug Harbor, Dr. F. Hollick.

Schollera macrocarpa (Ait.) Britton. Tottenville, W. T. Davis; New Dorp, Mrs. N. L. Britton; Kreischerville.

Azalea viscosa rosea Hollick. Arlington, W. T. Davis.

Gaultheria procumbens L. Giffords.

Kalmia angustifolia L. Bogardus' Corners.

Pyrola secunda L. Bogardus' Corners.

Fraxinus viridis Michx. f. Clifton and New Dorp.

Cynoglossum officinale L. Arlington, W. T. Davis.

Convolvulus Sepium repens (L.) Gray. Oakwood.

Ipomoea pandurata (L.) Meyer. Mariners' Harbor, W. T. Davis.

Gerardia purpurea paupercula Gray. New Dorp.

Veronica Anagallis-aquatica L. New Brighton, Dr. F. Hollick.

Pentstemon Digitalis (Sweet) Nutt. New Dorp, Mrs. N. L. Britton; West New Brighton, T. C. Leng.

Stachys cordata Ridd. Eltingville, W. T. Davis.

Mentha gentilis L. Egbertville, A. A. Tyler.

Mentha sativa L. New Dorp.

Mentha citrata Ehrh. Richmond Valley.

Conopholis Americana (L. F.) Wallr. Todt Hill, Mr. Stottler.

Plantago aristata Michx. St. George, in recently filled-in ground.

Brousonnetia papyrifera Vent. West New Brighton, Mariners' Harbor and Richmond, W. T. Davis.

Alnus glutinosa Willd. Egbertville, W. T. Davis (A number of trees, thoroughly naturalized and apparently spreading).

Alnus incana (L.) Willd. Grant City.

Quercus Brittoni Davis. Watchogue.

Salix fragilis latifolia And. Todt Hill.

Populus heterophylla L. Huguenot, W. T. Davis.

Tipularia unifolia (Muhl.) B. S. P. Tottenville.

Calopogon pulchellus R. Br. Watchogue, C. W. Leng.

Habenaria blephariglottis (Willd.) Torr. Watchogue, W. T. Davis.

Cypripedium acaule Ait. An albino form. Mrs. Heylyn.

Tradescantia Virginica L. Arlington, W. T. Davis.

Wolffia Columbiana Karst. Old Town Pond, Thos. Craig.

Potamogeton Spirillus Tuckm. Court House, Mrs. N. L. Britton.

Udora Canadensis Michx. Clove Lake, W. T. Davis.

Pinus echinata Mill. Linoleumville and not uncommon along the south side, W. T. Davis. Arrochar and Four Corners.

Eriophorum Virginicum L. Tottenville, W. T. Davis; Gifford's Mr. Twiggs.

Panicum pubescens Lam. Richmond Valley.

Panicum microcarpon Muhl. Tottenville.

Panicum commutatum Schultes. Richmond Valley.

Panicum verrucosum Muhl. New Dorp, A. A. Tyler.

Carex tenera Dewey. New Dorp, A. A. Tyler.

Carex muricata L. New Dorp.

Carex Muhlenbergii Schk. Abundant at Richmond Valley.

Carex tribuloides Wahl. Tottenville and Grant City; A. A. Tyler.

Dryopteris cristata (L.) Gray. Oakwood, Mrs. N. L. Britton. Mariners' Harber.

Azolla Caroliniana Willd. Clove Valley, Thos. Craig. (Introduced some years ago by Mr. Samuel Henshaw.)

Salvinia natans (L.) All. Silver Lake and in a small pond on Ocean Terrace, Thos. Craig. (Probably introduced.)

ARTHUR HOLLICK,

N. L. BRITTON.

New or Noteworthy American Grasses.—II.

By Geo. V. Nash.

Sporobolus asper (Michx.) Kunth. Enum. 1: 210. 1833.

Agrostis aspera Michx. Fl. Bor. Am. 1: 52. 1803.

Vilfa Drummondii Trin. Mem. Acad. St. Petersb. (VI.) Sc. Nat. 4: Botanique, 106. 1845.

Sporobolus asper var. *Drummondii* Vasey, Contr. U. S. Natl. Herb. 3: 60. 1892.

This grass and the next seem to have been confused. The plant named *S. asper* by Dr. Vasey is the *Agrostis longifolia* Torr., and not the *A. aspera* of Michaux, who apparently had in mind, so far as can be determined from his short description, the form with a long palet. The plant of Michaux, as here understood, has a long-acuminate, sometimes almost awned, palet, which usually much exceeds the scale; the outer scales narrow and acute; the culm and panicle, which is generally exserted, quite slender.

Grows from Delaware to Illinois and Missouri, south to Florida and Texas.

Vilfa Drummondii Trin. may eventually be separated as distinct, but at present it seems preferable to refer it to this species, intermediate forms being very numerous and apparently connecting the two.

Sporobolus longifolius (Torr.) Wood, Class-book, 775. 1861.

Agrostis involuta Muhl. Gram. 72. 1817. Not Poir. 1810.

Agrostis longifolia Torr. Fl. 90. 1824.

Vilfa Hookeri Trin. Mem. Acad. St. Petersb. (VI.) Sc. Nat. 4: Botanique, 106. 1845.

Sporobolus asper Vasey, Contr. U. S. Natl. Herb. 3: 59. 1892. Not Kunth. 1833.

This is usually a more robust plant than the preceding. The panicle is generally more or less included in the upper sheath, sometimes merely protruding from the sheath fissure. The spikelets are wider, with broad, obtuse scales and palet, the latter about equalling the third scale.

Occurs from Maine to Illinois and Kansas, south to Long Island, Tennessee, Mississippi and Texas.

SPOROBOLUS VAGINAEFLORUS (Torr.) Wood, Classbook, 775. 1861.

Vilfa vaginaeflora Torr. A. Gray, Gram. & Cyp. No. 3. 1834.

Sporobolus minor Vasey; Wats. & Coult. in A. Gray, Man. Ed. 6, 646. 1890. Not Kunth 1833.

Sporobolus filiculmis L. H. Dewey, Contr. U. S. Natl. Herb. **2**: 519. 1894.

The type of this plant, as indicated in A. Gray, Gram. & Cyp., is the form with long and narrow spikelets, the scales narrow and acuminate. Dr. Vasey took up and named as *S. vaginaeflorus* the form with shorter and broad spikelets, the scales merely acute. This plant is considered below.

SPOROBOLUS NEGLECTUS nom. nov.

Sporobolus vaginaeflorus Vasey, Wats. & Coult. in A. Gray, Man. Ed. 6, 645. 1890. Not Wood. 1861.

This is the plant that has long passed as *Vilfa vaginaeflora* Torr., but it is not the same, as indicated under the preceding species. Owing to this mistaken identity this plant appears to be without a name, and so the one given above is proposed. The broader and shorter spikelets, with the scales broad and merely acute, will readily separate this plant from the *S. vaginaeflorus* Wood.

In the vicinity of New York it is much less common than *S. vaginaeflorus*, which grows plentifully in many localities.

Dry sandy soil, Massachusetts to Kentucky, Tennessee and Kansas.

SPOROBOLUS BREVIFOLIUS (Nutt.) Scribn. Mem. Torr. Bot. Club. **5**: 39. In part. 1894.

Agrostis brevifolia Nutt. Gen. **1**: 44. 1818.

There seems to be much confusion in regard to *Sporobolus depauperatus* and *S. cuspidatus*. Forms of what appears to be a good species have been variously referred to either of the above. They agree well with the description of *Agrostis brevifolia* Nutt., and they are here referred to that species. The leaves are short, 1′–2′ long; the empty scales obtuse or merely abruptly acute, less than one-half as long as the acuminate and sometimes short-cuspidate flowering scale.

Grows from Anticosti Island and Maine to British Columbia, south in the mountains to New Mexico and California.

S. depauperatus (Torr.) Scribn. is a plant of the extreme northwest, occurring in Washington and Oregon, possibly extending southward in the mountains. The culms are short and decumbent, the internodes very short, usually ½′ long or less, the nodes often swollen; the empty scales broad, thin, white, delicate in texture, obtuse or acutish, more than one-half the length of the broad flowering scale, sometimes about equalling it.

In *S. cuspidatus* (Torr.) Wood the empty scales are acuminate and short-awned, more than one-half as long as the acuminate and awn-pointed narrow flowering scale. The plant is usually taller and has much longer leaves than either of the two species above mentioned, and ranges from Manitoba to the Northwest Territory, Missouri and Kansas.

ERAGROSTIS TRICHODES (Nutt.).

Poa trichodes Nutt. Trans. Am. Phil. Soc. **5**: 146. 1833–37.

Eragrostis Geyeri Steud. Syn. Gram. 272. 1855.

Eragrostis tenuis A. Gray, Man. Ed. 5, 632. 1867. Not Steud. 1855, nor *Poa tenuis* Ell. 1817.

Nuttall's name for this plant is the oldest, and is here taken up. This grass extends from Illinois westward and southwestward, and is not known to occur in South Carolina or Georgia, the region covered by Elliott's Botany. It could hardly, therefore, be the same as the *Poa tenuis* of that work, which, according to a specimen of that plant in the Columbia College Herbarium, labeled as coming from Elliott, is apparently the same as the grass now known as *Eragrostis capillaris* Nees, and which well accords with the description given by Elliott of his *Poa tenuis*.

✓POA BUCKLEYANA nom. nov.

Poa tenuifolia Buckley, Proc. Acad. Phila. **1862**: 96. 1862. Not A. Rich. 1851.

No other name for this plant can be found, and so the above is given it in honor of Dr. S. B. Buckley, who first published a description of it.

Vegetable Spiralism.

BY GEORGE MACLOSKIE.

My paper on Antidromy* attempted to show that every phenogamic plant produces two kinds of seeds, having their embryos turning in opposite directions, according to the side of the carpellary leaf on which they originated; also that the forthcoming plants have a primitive twist in opposite directions, showing itself in the histology of the stem, the dextrorse or sinistrorse phyllotaxy and anthotaxy, and in some cases in the structure of the carpels. The statement that the grains of Maize produce dextrorse or sinistrorse plants, according to the orthostichy of the ear in which they were produced, depended on hasty dissection; and although it seemed at first to be confirmed by the seedlings raised from the grains, I now find that there is no apparent constancy in this matter. My last experiment included nineteen seedlings grown from twenty grains taken in order from one of the paired rows in an ear (the row opposite my left hand) giving Nos. 1, 2, 3, 6, 8, 9, 10, 12, 15, 17, 20 with sinistrally overlapping leaves (Sc. the 1st leaf above the pileolus having its left margin external), and Nos. 4, 5, 7, 11, 13, 14, 18, 19 with dextrally overlapping leaves (No. 16 being abortive): thus giving eleven of one kind against eight of the other kind. In the grains from another homologous row, this proportion was nearly reversed. It is therefore necessary for the present to regard the beautiful symmetry of the ear of Maize (more beautiful in its early development than in its maturity) as a rearrangement of members at first as promiscuously arranged as are the staminate flowers of its panicle.†

Besides cases previously cited we have significant examples of antidromy in the seeds of *Salsola* (figured in Engler and Prantl, 3: 1a, 84. *Y*, *Z*), in the spirals of the Screw-pines, in the florets on the large head of the Sunflower and other large Compositae, which concur with the phyllotaxy, and even in the sword-like leaves of *Acorus Calamus*, those of one plant being dextrorsely

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*BULLETIN, 22: 379. Correct *erratum*, p. 380, three lines from foot, "distichous," so as to read "tristichous."

†I am obliged to the eminent agrostologist, Prof. W. J. Beal, for friendly criticism on this point.

twisted, and of another plant sinistrorsely. All the long leaves of all plants of *Typha* (both species) have a sinistral twist, in this showing no antidromy; but the mode of overlapping of the margins of their leaves near the nodes, which is the same for all the leaves of one plant, is contrary as between different plants. If this is a case of genuine antidromy, it is an argument against the view that the ovules of Typha arise terminally on the floral axis, a view which on other grounds has been doubted.

In the somewhat decussate leaves of *Paulownia*, and of the shaded branches of *Forsythia*, we can trace a spiral twist by following any one of the leaf orthostichies (they twist all in one direction about Princeton, where the plants are not propagated from seeds). But the branches of *Forsythia* when exposed to the sunlight lose their decussation and have all their leaves in two horizontal rows, thus demonstrating the controlling influence of the light. I believe that in a similar way many of our plants, as Elm, Beech and Morning-glory, have sacrificed their primitive phyllotaxy to the allurements of sunshine.

The Coniferae furnish an example showing how growth may supersede or even reverse the primitive order of parts. The young cones of *Picea*, *Tsuga* and other trees have the same spiral caste as the phyllotaxy, when we estimate their spirality by taking the longer of the two dominant curves as we do for the phyllotaxy. But after the cones open to give exit to the seeds, there comes a displacement of the scales, producing a false spirality in the contrary direction; thus the same tree, or even the two sides of a half-opened cone may present a quasi-antidromy. This may possibly be the explanation of published observations as to Conifers having antidromic cones on the same tree.*

The cases of *Arum, Iris* and *Juncus* were previously referred to as giving antidromic plants produced not by seeds but by division of the same rootstalk. A more curious case of diversity within the same plant is that of Bilsted (*Liquidambar Styraciflua*), which is cited in books as having opposite spirals in stem and branches. Every branch of this tree is true to its own phyllotaxy, with a $\frac{2}{5}$ divergence, dextrorse or sinistrorse for each, and this persisting through the annual innovations, whose crowded scale-scars are true to their phyllotaxy. In the horizontal members even the ridges of cork partially conform to the phyllotaxy of the particular member by a slight flexure to one side or the other. But the branches from the stem, or the branches from a branch do not necessarily conform to the phyllotaxy of the part from which they diverge; some of the daughter-branches may be homodromic, others heterodromic, as compared with the mother-branch, nor have I been able to discover any law in the case.

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* *American Naturalist*, August, 1873.

Perhaps these instances may favor the view that what we have in antidromy is not so much a special kind of heredity as an impulse depending on physical or nutritional causes, giving a bias to the young embryo or the young bud, which when once received is maintained. But whatever be the explanation offered, the facts are too important to be overlooked.

Sachs in his *History of Botany* treats Phyllotaxy as an exploded error, and gracefully celebrates its obsequies with the parting note that though wrong, it was useful in its day, adding "we would as little wish to omit it from our literature as modern astronomy would wish to see the old theory of epicycles disappear from its history." But what he and others condemned was an artificial or idealistic law imposed on plants in mathematical drapery; the twists that will naturally result from pressure upon young parts or from peculiarities of direction and of amount of nutriment, and from the modifying influence of light or climbing habits, are conceptions that were unknown to the fathers of mathematical phyllotaxy. From inattention to these considerations our botanists often miss what ought to be plain enough. Thus among the cryptogams Sachs gives us spores of *Equisetum* with a wrong spirality for their elaters (I confess my own sin here). Dodel-part gives oögonium of *Chara* wrong twisted; Engler and Prantl seem to require amendment as to *Erodium* (3: 4. 2) and as to *Halicteres* (3: 6. 93); and such instances may be multiplied.

Homodromic spiralism is not infrequent in phenogamic as well as in cryptogamic plants; as the dextrorse twining of some Leguminosae, of Convolvulaceae (including the Dodders) and of *Celastrus;* and other species are sinistrorse. Whilst it was shown in the paper on Antidromy that the mode of bursting of the carpels of Balsam is antidromic, in harmony with the phyllotaxy, we find that the carpellary "beaks" of *Geranium*, *Pelargonium* and *Erodium*, of the same natural order with Balsam, are all dextrorsely twisted. In these cases all the individuals of a species, or even of a suborder or order of plants, have the same kind of spiralism. But the leaves of all these are antidromic.

As a contrast to this we sometimes find a quasi-antidromy within the same plant, or even in the same carpel. Thus *Hibiscus* has the corollas of flowers on opposite sides of the same branch slightly contorted in contrary directions. The pod of the *Lotus corniculatus* and other Leguminosae bursts open through the forcible curving of its valves into antidromic spirals. The same occurs in *Joosia* of Rubiaceae (figure in Engler and Prantl, 4: 4. 46), and in the opening with a spring of the cocci of *Ricinus*. (A branch of this in fruit if left over night on a table may next morning have all its cocci opened and its seeds scattered about). Doubtless this is the dehiscing mechanism of the sandbox fruit of *Hura*.

The awns of Gramineae usually have secondary twists of functional significancy. In *Anthoxanthum* a brown dextrally twisted base is surmounted by a pale straight seta; in *Danthonia*, *Stipa*, etc., the base is a brown ribbon dextrally twisted, and this is surmounted by a rigid sinistrorse style. On the application of water the basal ribbon straightens out, causing the style to screw its way into the soil, into the wool of a sheep, or into the clothing and skin of man (witness Captain Cook's Crew in Australia in 1770). This kind of double twist may be termed *didromic* (as suggested by my colleague, Prof. Brackett). It is found in the setæ of some mosses (as figured by Sullivant, *Icones muscorum*, supplement), for example, *Funaria Americana*, *Pottiariparia*, *Rhynchostegium;* or some species of the mosses have the upper part of the seta dextrorsely, and others have it sinistrorsely twisted; but we do not see the significance of these peculiarities.

Charles Darwin showed that in some instances this didromic spirality is a physical necessity, as where tendrils must be shortened and yet their extremities are not to be rotated. This is the sort of spiral made by the cord-like scape of *Vallisneria spiralis*, so pulling down the fertilized carpel without having to turn it round; and I find that in some plants of this species the upper section is dextrorsely spiral, and the lower section sinistrorsely, whilst in other plants these relations are reversed. Thus we have didromy within each plant of *Vallisneria* and antidromy between neighboring plants.

It would be dangerous at this stage to attempt generalizations as to the cyptogams. I may be permitted, however, to call attention to a few points. In the Atlases of Vegetable Palaeontology, by Schimper, Zeiler, Lesquereux and others, some of the figures of Carboniferous Acrogens, as Lepidodendron, Ulodendron, cones of Lepidostrobus, indicate a trend to one side which would indicate antidromy if others be found trending to the other side. The photograph of *Lepidodendron lycopodioides* in Plate LXX. of Zeiler's Atlas, does give a contrary spiral to that in Schimper's plates, but Zeiler's photograph may have been reversed in the process. The segments of apical cells of Hepaticae and Pteridophytes seem to indicate in some cases a direct or 'clock-wise' order of appearance, and in other cases a reverse order; but I do not know whether they may not vary in the same individual plant, or whether, on the other hand, they may not be homodromic in the totality of a species. I have been unable to find any variation of phyllotaxy in *Lycopodium* and allied forms, the great bilateral symmetry of the leafy axis obscuring the traces that might exist. But in two specimens of the tree-fern *Alsophila* the common phyllotaxy of $\frac{2}{5}$ can be made out at the apex of the stem; in both our Princeton specimens the spirality is dextrorse (that is, after the course of the thread of a common screw). If anybody can produce a specimen with sinistrorse phyllotaxy, he will thereby furnish the lacking evidentiary fact, and complete the proof of the antidromy of the ferns.

Botanical Notes.

Two new botanical Serials. One of our esteemed contemporaries has recently expressed some irritation on learning of the founding of a new serial publication. The number of opportunities for the publication of botanical papers is indeed great, but the supply of matter evidently exceeds the space provided, for we very seldom learn that any journal has suspended printing, and most of them have had such pressure brought upon their space that they have been obliged to increase their number of pages. The "Journal of Botany" is indeed an exception to the general rule, having continued about the same annual dimensions for a long time.

The new channels of publication are both German. The Berlin Botanical Garden began in January to issue its "Notizblatt des Königlichen botanischen Gartens und Museums zu Berlin," proposing to distribute it at irregular intervals as matter becomes available. The first number bears date January 2d, the second June 5th. They contain much interesting information on species grown in the Garden, on additions to the Museum, and numerous descriptions of new species in the Herbarium contributed by Engler, Urban, Gurke, Schumann and Gilg.

The "Allgemeine botanische Zeitschrift, für Systematik, Floristik, Pflanzengeographie, etc.," was also commenced in January and is published monthly at Karlsruhe, under the editorship of A. Kneucker. It is a general botanical journal, containing besides original communications, reviews, notes on literature and on institutions, societies, exsiccatae and explorations. N. L. B.

Compound Leaves in Rubus odoratus. The leaves of this species are always described as simple. A student of mine, Mr. Millett Thomson, has just shown me, from a plant in his garden, that the leaf with its long petiole first falls, leaving a short stub or main petiole behind, which is itself later deciduous. This, it will be recalled, is something like what happens in the Japanese Ampelopsis, except that there the leaf is sessile on a long petiole, which falls after the blade itself has separated. Both of these plants then have unifoliolate leaves. W. WHITMAN BAILEY.

Sisymbrium altissimum Linn. in Minnesota. Mr. L. H. Dewey has called attention, in a recent number of the BULLETIN, to the occurrence of *Sisymbrium altissimum* Linn. in the side streets of Minneapolis.

This plant has been previously reported from Minnesota localities. The Minneapolis Daily Tribune of September 22, 1894, contains an account of my discovery of this species near Minneapolis. Since the first introduction of a few straggling specimens, the plant has spread so as to become a nuisance in the elevator districts on the outskirts of Minneapolis and St. Paul. Specimens have been found also in several other localities in Hennepin, Ramsey and Dakota counties. EDMUND P. SHELDON.

MINNEAPOLIS, MINN., NOV. 12, 1895.

I found this plant in considerable quantities along the railroad at Port Arthur, Lake Superior, in September, 1889. We also have a specimen of it collected at Danville, Quebec, in 1894.

N. L. BRITTON.

Reviews.

Synoptical Flora of North America: Vol. I. Part I. Fascicle I. Polypetalae from the Ranunculaceae to the Frankeniaceae. By Asa Gray, LL. D., and Sereno Watson, Ph. D., continued and edited by Benjamin Lincoln Robinson, Ph. D. (Issued October 10, 1895.)

The second volume of this work was published some years since, in two parts, the first part appearing in the year 1884, while the second was issued in 1878. In 1886 a revised edition of these two parts with an appendix of additions and corrections was issued by the Smithsonian Institution. The first fascicle of part I., volume I., has now been issued from the University press at Cambridge after a lapse of eleven years. Dr. Robinson is to be congratulated on the completion of the pages under consideration and we are promised a second fascicle in the near future. The bulk of the matter was written by Dr. Gray; Dr. Watson subsequently took up the work and continued it until his death; since then Dr. Robinson has completed parts left unfinished by the other authors, besides editing their manuscripts by bringing together facts of recent discovery, mostly in the form of foot-notes.

The pages contain a vast amount of useful and valuable information and the book will be welcomed by everyone. Together with the many good qualities of this issue appear the same faults that characterize the second volume. After a general key to the families, the Ranunculaceae are taken up, and other families follow on the old Candollean sequence to Frankeniaceae inclusive. It is to be regretted that so great a work must be continued on a system of classification which has proved itself inadequate. The want of system in the matter of nomenclature is also to be regretted, for here, as in the former parts, sentiment is the predominating guide in place of rule.

The generic limits as a rule are well taken; some genera, however, are too composite according to modern ideas. The interpretation of species is in many cases not as good as our present knowledge would permit. In *Clematis*, *C. Addisonii* is taken up in its proper place, but *C. viornioides*, a very distinct form, if not a good species, is merely hinted at. *Clematis ovata* is reduced to *C. ochroleuca*, a position not warranted by the abundant specimens of recent collection. The author, following Coulter, has reduced *Clematis Scottii* to a variety of *C. Douglasii;* to be consistent why not reduce *C. Catesbiana* to a variety or state of *C. Virginiana?* In *Ranunculus* we find *R. Allegheniensis* Britton inserted as a species, while *R. micranthus* Nutt. stands as a variety of *R. abortivus* L. In *Aquilegia*, *A. saximontana* Rydberg is published for the first time and well distinguished from the related *A. brevistyla* Hook. Very scant courtesy is paid to *A. Canadensis flaviflora*, but almost immediately following we find *A. caerulea* var. *albiflora* A. Gray, described as a new variety (while there are at least two published available specific names for it), and its characters as given separate it from the type in only just the same degree that differentiates *flaviflora* from *Canadensis.* We can only assume that the editor holds a color variety proposed by Gray to be valid, while rejecting one maintained by others. On page 76, *Nymphaea odorata* var. *minor* appears in the old stereotyped form. Why should this state be called a variety when it is the original of the species *odorata?* If a variety must be maintained it should be done in a consistent way. Little recognition is given an apparently distinct species of *Castalia* from Florida and adjoining territory. The editor says "this form has been confidently identified with *N. reniformis* Walt. by the collector, . . . a disposition in no sense warranted by the brief and wholly dubious characterization of Walter's species." If there were nothing but Walter's description to support Mr. Nash's position, it certainly would be weak, but careful field observations, morphological characters separating the form from related species, and the fact that the plant is very common in Walter's region, furnish pretty strong evidence in favor of its correct identification. So other cases might be cited. The geographic ranges of many species as given are too restricted, as a few appended examples will show, and no data bearing on altitudinal distribution are furnished.

Clematis Viorna. Common east of the mountains as far south as middle Georgia.

Clematis Addisonii. Also in the Cumberland Mountains, Tennessee.

Clematis Douglasii Scottii. Also in Montana and Dakota.

Clematis verticillata. Occurs in southwestern Virginia.

Clematis alpina tenuiloba. Also in Colorado.

Thalictrum coriaceum. Also in the Cumberland Mountains, Tennessee.

Myosurus minimus. Occurs in southeastern Virginia.

Ranunculus recurvatus. Also in Montana.

Ranunculus abortivus micranthus. Common south to southern Pennsylvania.

Ranunculus septentrionalis. West to Nebraska.

Caltha palustris. Also west to Nebraska.

Aconitum Columbianum. East to the Black Hills, South Dakota.

Cimicifuga racemosa cordifolia. Occurs in the mountains of Virginia.

Xanthorrhiza apiifolia. Ranges east of the mountains and as far south as middle Georgia.

Delphinium tricorne. Occurs as far west as Nebraska.

Delphinium exaltatum. Also west to Nebraska.

Magnolia tripetala. Grows as far south as middle Georgia.

Asimina triloba. Occurs east to New Jersey and west to Nebraska.

Asimina angustifolia. Rather common as far north as middle Georgia.

Brasenia Schreberi. Also south to Georgia and Florida.

Menispermum Canadense. Occurs west to Nebraska.

Berberis repens. Ranges east to the Black Hills, South Dakota.

Argemone alba. Grows in southwestern South Dakota.

Dicentra Canadensis. Occurs in Nebraska.

Corydalis curvisiliqua. East to Louisiana and Florida, also north to Nebraska.

Corydalis aurea occidentalis. Common in Nebraska.

Arabis dentata. Occurs west to Nebraska.

Arabis laevigata. Also south to middle Georgia and west to the Black Hills, South Dakota.

Arabis Holboellii. Ranges east to Nebraska.

Lesquerella Ludoviciana arenosa. Occurs in the Black Hills, South Dakota.

Physaria didymocarpa. Grows in Nebraska.

Nasturtium sessiliflorum. Ranges west to Nebraska.

Cristatella Jamesii. Common in western and central Nebraska.

Cleome lutea. East to Nebraska.

Cleomella angustifolia. Also in Colorado and Nebraska.

Viola palustris Occurs in the Black Hills, South Dakota.

More or less inconsistency in the treatment of families is apparent; compare, for an example, the Ranunculaceae with the Cruciferae; in the former the genera are treated as collectives, while in the latter they appear as segregates and are naturally much clearer. We are pleased to note that the Cruciferae is the best described family in the fascicle.

The book has very few typographical errors, but the often copious foot-notes spoil the appearance of the pages. The matter contained in these notes might better have been incorporated in the text. A curious statement occurs on page 42, where we are told that *Eranthis hyemalis* is "a relict of former cultivation." On pape 191, Table Mountain is given as the locality for *Hudsonia montana.* Table Rock is meant, as Table Mountain is not in North Carolina, but in South Carolina and is a very different place. Dr. Gray confused these two names many years ago and botanists seem to have been unable to get them right since.

J. K. SMALL.

Our Edible Toadstools and Mushrooms and How to Distinguish Them is the title of a volume recently issued by the well-known firm, Harper & Brothers, New York. The author is W. Hamilton Gibson, who has for a long time given special attention to the subject here set forth. Previous American booklets, reports, etc., bearing on this subject have been less extensive, complete and satisfactory, yet they have been, as it were, skirmish lines that have made this one possible. It contains 337 pages, and, according to the title page, 30 colored plates and 57 other illustrations The full-page plates are 38. An "Introduction" of 40 pages is no less interesting and important than the body of the work, which is devoted to the descriptions and illustrations of about 30 edible and a half dozen or more poisonous or suspected species. The descriptions are given in a general or popular style, followed in each case by a more condensed and systematized one, but in both all unnecessary technical terms are avoided, inasmuch as the work is especially designed for those who simply desire a better acquaintance with our most common and easily-recognized esculent species, so that they may feel safe in collecting and using them for food. Great care has been taken in placing safeguards around the genus *Amanita* that there might be no danger of an invasion of its dangerous precincts. Indeed, as a concession to the ignorance or carelessnes of such as might otherwise make serious mistakes, this line of safety has confessedly been drawn so rigidly as to exclude from use even some well-known edible species. Nevertheless, the author has done well in showing the worthlessness of many popular rules and tests for discriminating between the good and the bad, and in insisting upon a sufficient knowledge for the recognition of each species to be eaten, save in a few exceptional genera.

The work is enriched by a list of the edible fungi of North Carolina, taken from the catalogue of Rev. M. A. Curtis, by a history of a successful use of atropine, the antidote of amanitine, in a case of dangerous mushroom poisoning, by a series of thirty-four recipes for preparing, cooking or preserving mushrooms, and by three pages of bibliography pertaining to the subject. Marginal indices and a general index at the end of the volume facilitate reference to any subject.

In a work so full of good things and so generally accurate and reliable as this is, one feels like uttering only words of praise and commendation and passing in silence the very few mistakes that might by a critical mind be taken as blemishes. Happily those that have met my notice are so few and of such a character as not to interfere at all seriously with the design and usefulness of the work, and perhaps would scarcely be noticed by any one except a close student of mycology. Such a one might say there was some mistake in the rather sweeping assertion in the description of *Russula virescens*, that "a faint fluting of the edge" is "a peculiarity of all the Russulæ;" and also that there must be some error in describing the spores of *Boletus alveolatus* in one place as "rose-colored" and in another as "yellowish-brown." There is also quite a discrepancy between the characters assigned in this work to *Clavaria formosa* and *Lycoperdon saccatum* and those found in European works, so that I suspect some misconception of these species, but I do not see how these mistakes can lead the mycophogist into any serious danger.

The publishers have evidently done their part toward making the book attractive. Plates, press work and paper are all good.

We believe that this very useful and creditable volume will be the means of giving a renewed and stronger impulse to American mycology, and that those who are fortunate enough to obtain it will soon be demanding the means of obtaining a knowledge of other species which will attract their notice and which are no less desirable and available for food than those here described.

CHARLES H. PECK.

Proceedings of the Club.

WEDNESDAY EVENING, OCTOBER 30TH, 1894.

The President in the chair and 34 persons present.

The committee on admissions reported favorably on the nominations of Miss Annie E. Hamilton, Mrs. Archibald D. Russell, Dr. F. C. Stewart and Mrs. Theron G. Strong, and they were elected active members, the Secretary being directed to cast an affirmative ballot.

The following announced papers were then presented:

"Notes on the Morphology of the Leaves in *Galium*," illustrated by specimens and drawings, by Mr. A. A. Tyler.

"Remarks on the Luminous Moss, *Schistostega osmundacea*," illustrated by specimens and drawings, by Elizabeth G. Britton.

"Some adaptive structural Features in the Lichens," illustrated by specimens and drawings, by Dr. Albert Schneider. (To be published in the December BULLETIN.)

TUESDAY EVENING, NOVEMBER 12TH, 1895.

Vice-President Lighthipe in the chair and 37 persons present.

Dr. Britton nominated for active membership Mr. B. Heritage, of Mickleton, Gloucester county, N. J.

Prof. Emily L. Gregory presented a paper on "Theories of the Origin and Nature of the Starch Grain," giving the history of the subject from the work of Naegeli to that of Meyer, who has recently submitted evidence that the substance of the starch grain is truly crystalline and not organized, so that all our theories of the growth of organized substance based upon the starch grain as a type fall, and we must begin to study the subject *de novo*.

The Secretary exhibited an ear of corn showing some perfect kernels of sugar corn distributed among those of yellow flint, as well as many kernels of an intermediate character.

Mr. E. S. Miller remarked upon the blooming of certain Cactaceae in cultivation, notably *Cereus Thurberi*, the plant being only a foot or two high and the flowers very small.

Index to recent Literature relating to American Botany.

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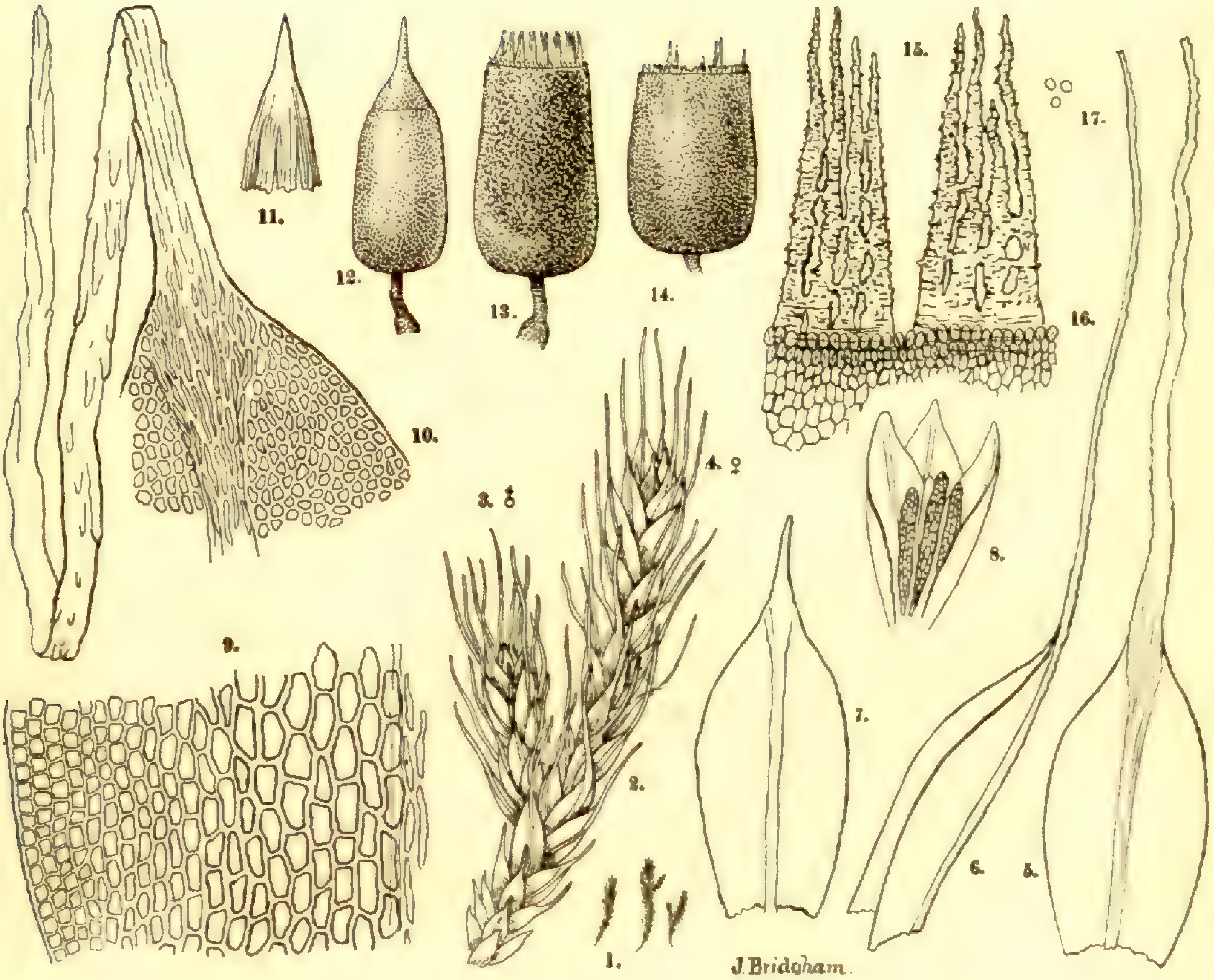
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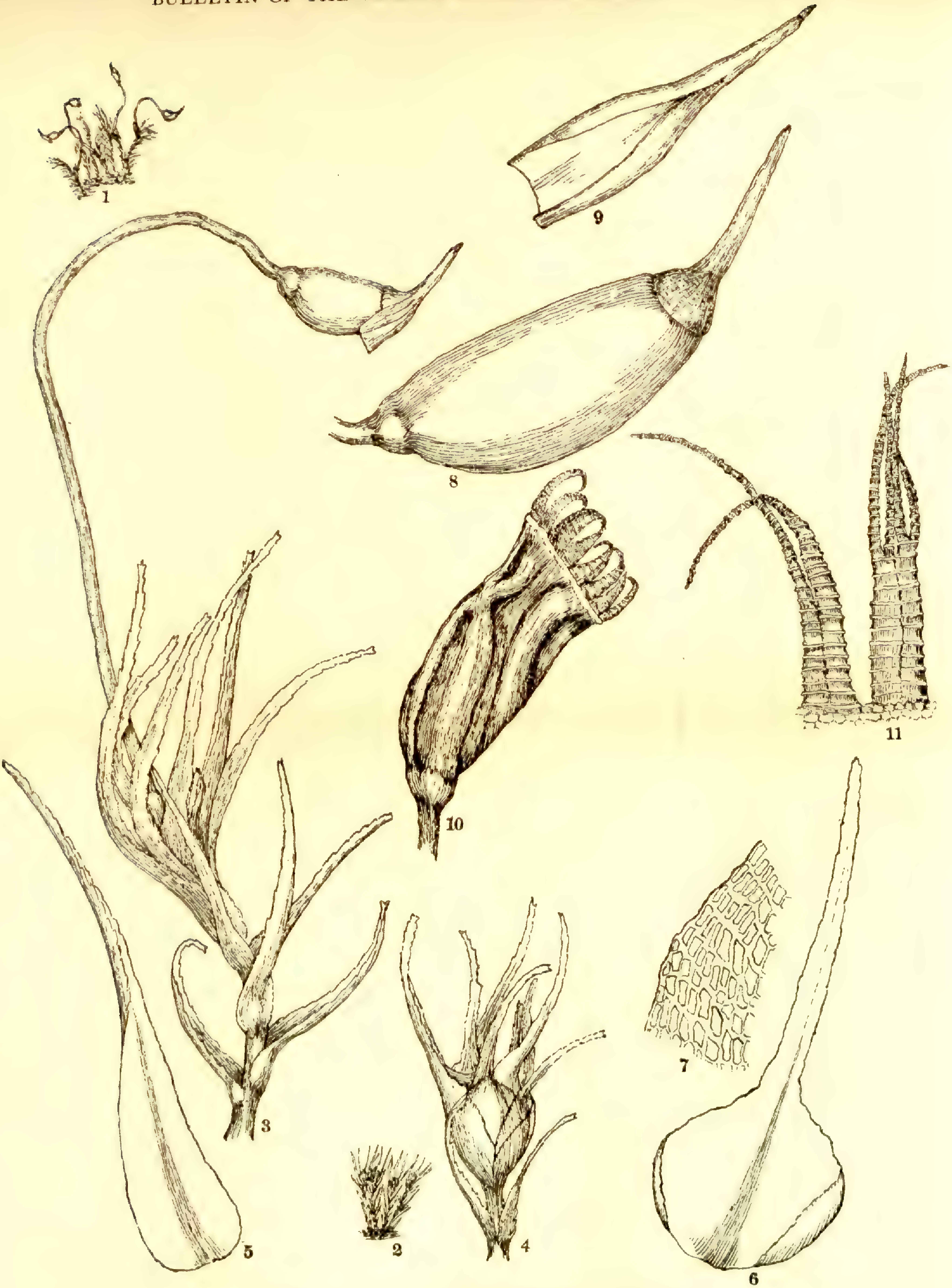
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AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 22. Lancaster, Pa., December 30, 1895. No. 12.

New Species of Fungi.

By Chas. H. Peck.

Amanitopsis velosa.

Pileus at first subglobose, then campanulate or nearly plane, generally bearing patches of the remains of the whitish felty or tomentose volva, elsewhere glabrous, becoming sulcate-striate on the margin, buff or orange-buff, flesh compact, white; lamellae close, reaching the stem, subventricose, pale cream color; stem firm, at first tomentose and attenuated at the top, then nearly equal, stuffed, white or whitish, closely sheathed at the base by the thick volva; spores globose, .0004 to .0005 in. broad.

Pileus 2 to 4 in. broad; stem 3 to 4 in. long, 3 to 4 lines thick.

Under oak trees. Pasadena, California. April. A. J. McClatchie.

This fungus is closely related to *Amanitopsis vaginata*, from which it may be separated by the more adherent remains of the thicker volva which sometimes cover the whole surface of the pileus, and by the thicker lamellae which are somewhat adnate to the stem and terminate with a decurrent tooth.

Tricholoma semivestitum.

Pileus thin, expanded, centrally depressed or subumbilicate, glabrous, blackish-brown, the margin decurved or involute; lamellae close, emarginate, often dentate or eroded on the edge, whitish tinged with blue; stem short, solid, usually slightly thickened at the base, the lower part clothed with a tawny-brown tomentum, the upper part brown; spores broadly elliptical or subglobose, uninucleate, .00016 to .0002 in. long, .00016 broad.

Pileus 6 to 12 lines broad; stem 8 to 12 lines long, 2 to 3 lines thick.

"On old grass roots in sandy prairie pasture," Rooks County, Kansas. July. E. Bartholomew.

The small size, dark-brown pileus and semitomentose stem are the prominent characters in this species.

COLLYBIA MICROSPORA.

Pileus thin, convex, subumbonate, glabrous, white; lamellae broad, subdistant, nearly plane, white, changing to brown in drying; stem slender, hollow, glabrous, white, becoming brown in drying; spores minute, broadly elliptical, .00016 in. long, .00012 broad.

Pileus about 6 lines broad; stem about 1 in. long, 1 line thick.

Wet ground under bushes. Rooks county, Kansas. July. Bartholomew.

This plant, in the dried state, might easily be taken for some species of *Naucoria*, since the lamellae assume a rusty-brown hue. This change of color in the lamellae and stem is a peculiar feature of this small species which the notes of the collector record as "pure white throughout."

MYCENA CAESIA.

Pileus submembranous, campanulate, striate, glabrous, grayish-brown, blackish or blackish-brown in the center; lamellae thin, subventricose, grayish or bluish-gray; stem slender, hollow, glabrous, grayish-brown; spores subelliptical, slightly apiculate at one end, .0003 to .0004 in. long, .00016 to .0002 broad.

Pileus 4 to 6 lines broad; stem 1 to 2 in. long, .5 to 1 line thick.

Among sphagnum. Newfoundland. September. Rev. A. C. Waghorne.

I have seen dried specimens only and am not certain that the bluish-gray hue of the lamellae is so conspicuously present in the fresh plant. The margin of the pileus is sometimes tinged with yellowish-brown.

HYGROPHORUS SPHAEROSPORUS.

Pileus fleshy and thick in the center, subobconic, convex, obtuse or slightly umbonate, whitish, inclining to reddish-brown, the margin incurved, flesh firm, white; lamellae rather broad, subdistant, adnate or slightly decurrent, white; stems tufted, flexuous, solid, glabrous, often slightly thickened at the base, colored like the pileus; spores globose, .00024 to .0003 in. broad.

Pileus 6 to 12 lines broad; stem 1 to 2 in. long, 2 to 3 lines thick.

Iowa. October. Communicated by C. McIlvaine.

The fresh plant is said to have no decided odor, but when partly dried it emits a slight but rather unpleasant odor. It belongs apparently to the Section Camarophyllus, and is related to *Hygrophorus Peckii.*

MARASMIUS SUBTOMENTOSUS.

Pileus thin, at first subcampanulate, then convex or nearly plane, even or slightly striate on the margin, minutely tomentose-pubescent, grayish or reddish gray; lamellae broad, subdistant, free or but slightly adnexed, ventricose, colored like the pileus; stem equal or slightly swollen toward the base, inserted, velvety-tomentose, grayish or grayish-brown, white within; spores .0004 to .0005 in. long, .0002 to .00025 broad.

Pileus 5 to 9 lines broad; stem about 1 in. long, 1 line thick.

Abundant on roots of grasses and other plants in sandy soil. Kansas. July. Bartholomew.

The minute tomentum of both pileus and stem which gives them a grayish hue, the inserted stem and the free subdistant lamellae mark the species.

MARASMIUS BADIUS.

Pileus thin, convex, even, glabrous, bay-brown or reddish-brown; lamellae narrow, subdistant, adnate, whitish; stem glabrous, hollow, blackish-brown; spores broadly elliptical, .0002 in. long, .00012 broad.

Pileus 3 to 6 lines broad; stem about 1 in. long, 1 line thick.

Decaying sticks lying on wet ground. Kansas. July. Bartholomew.

In the dried specimens the stem is of a darker hue than the pileus. This gives a peculiar appearance to the plant and makes the species easily recognizable.

VOLVARIA STRIATULA.

Pileus thin, convex or nearly plane, minutely silky, striate on the margin and somewhat reticulate when dry, white; lamellae narrow, free, white, becoming flesh color; stem short, glabrous, white, with the cup-like remains of the membranous volva at the base; spores subglobose, uninucleate, .0003 in. long, nearly as broad.

Pileus 6 to 9 lines broad; stem about 1 in. long, .5 to 1 line thick.

Wet ground under weeds. Kansas. July. Bartholomew.

This species is allied to *V. parvula*, from which it is separated by the striate margin of the pileus and the larger and nearly globose spores. In the dried specimens there are transverse ridges or wrinkles between the marginal striations which give a reticulate appearance.

PLUTEUS STERCORARIUS.

Pileus very thin, nearly plane, glabrous, pure white: lamellae rather broad, close, free, flesh color; stem equal, solid, glabrous, white; spores large, even, commonly uninucleate, .0005 to .0006 in. long, .0003 broad.

Pileus about 2.5 in. broad; stem 3 in. long, 3 lines thick.

Manure heaps. Kansas, July. Bartholomew.

The habitat of this species is peculiar. Most of the species of this genus grow on decaying wood and have smaller spores.

INOCYBE RADIATA.

Pileus thin, convex or subcampanulate, distinctly umbonate, silky-fibrillose, slightly rimulose, distantly radiately wrinkled when dry, yellowish-brown, the umbo commonly blackish-brown; lamellae rather broad, close, emarginate, brownish becoming tawny-cinnamon when old, whitish on the edge; stem equal, solid, subglabrous, a little paler than the pileus; spores subovate, slightly nodose or angular, .0004 to .0005 in. long, .0002 to .00025 broad.

Pileus about 1 in. broad; stem 1 to 2 in. long, 1 to 2 lines thick.

In open grassy ground. Massachusetts. Aug. and Sept. W. D. Jackson.

The species belongs to the Rimosae. In general appearance it is similar to *I. fuscodisca*, *I. infida* and *I. agglutinata*, but the radiating ridges of the dried pileus and especially the peculiar spores easily separate it from any of these. Its spores are somewhat variable. Some are nearly even, others have one or two nodes, and many of them are irregular or angular like the spores of species of *Entoloma*. Some are nearly elliptical in outline, but generally they are narrowed toward one end. They are mostly one or two-nucleate. The radiations of the pileus are not noticeable in the fresh plant.

FLAMMULA DECURRENS.

Pileus thin, umbilicate centrally depressed or funnelform, moist, minutely floccose-squamulose, pale yellow or cream color; lamellae subdistant, strongly decurrent, pale yellow becoming ochraceous, the interspaces sometimes veiny; stem equal or tapering downward, minutely downy, stuffed with a cottony pith, colored like the pileus; spores elliptical, .0003 to .00035 in. long, .00016 broad.

Pileus about 1 in. broad; stem 6 to 10 lines long, 1 to 2 thick.

Wet ground in shade of bushes. Kansas. July. Bartholomew.

The species is easily known by its color being a uniform rich creamy or sulphury hue in the fresh plant, and by its strongly decurrent lamellae which become ochraceous-yellow in the dried state.

CREPIDOTUS CINNABARINUS.

Pileus thin, sessile, resupinate or reflexed, minutely tomentose or pulverulent, cinnabar-red; lamellae rather broad, subdistant, minutely reddish-flocculent on the edge, brownish-tawny in the dried plant; spores broadly elliptical, .0003 in. long, .00024 to .00028 broad.

Pileus 3 to 4 lines broad.

Decaying wood. Michigan. Sept. L. N. Johnson.

STROPHARIA CÆSIFOLIA.

Pileus convex, glabrous, white or whitish, sometimes brownish in the center; lamellae close, rounded or emarginate behind, light blue, becoming dingy bluish-brown; stem equal or slightly thickened at the base, solid, glabrous, white or whitish, the annulus white; spores subelliptical, .0004 to .0005 in. long, .00024 to .0003 broad.

Pileus 1 to 2 in. broad; stem 1 to 1.5 long, 2 to 3 lines thick.

Low sandy pastures. Kansas. July. Bartholomew.

The collector of this plant remarks that it is much like the common mushroom, *Agaricus campester*, except that its lamellæ have a fine light blue color instead of pink. This is an unusual and very distinctive character. In the dried specimens the lamellae have assumed a dingy grayish-blue hue, inclining to brown.

HYPHOLOMA CUTIFRACTA

Pileus thin, campanulate or expanded, sometimes faintly striate on the margin, grayish-buff, the disk sometimes darker, the cuticle commonly irregularly rimose; lamellae thin, close, adnate, at first white or whitish, then rosy-brown; stem long, slender, hollow, glabrous, white; spores elliptical, brown, .0003 in. long, .0002 broad.

Pileus 1 to 2 in. broad; stem 3 to 4 in. long, 1 to 2 lines thick.

About stumps of Lombardy poplar. Kansas. July. Bartholomew.

This species is closely related to *H. incertum*, but differs in its long slender stem and in its cuticle cracking in an irregular manner and revealing the thin white flesh beneath. No remains of the veil are visible in the dried specimens. Sometimes the margin of the pileus is deeply split.

PSATHYRELLA LEUCOSTIGMA.

Pileus submembranous, campanulate, striate, bluish-white when fresh, changing to sepia-brown when dried, the apex remaining whitish; lamellae close, lead color when young, becoming black with age, whitish on the edge; stem slender, flexuous, hollow, white; spores black, elliptical, .0005 to .0006 in. long, .0003 broad.

Pileus 4 to 6 lines broad; stem 1 to 1.5 in. long, about 1 line thick.

Wet ground under trees. Kansas. July. Bartholomew.

This pretty little species is well marked in the dried state by the white apical spot on the pileus. The plant is probably hygrophanous in the fresh state.

PSATHYRELLA BARTHOLOMAEI.

Pileus thin, subconical or convex, glabrous, striate on the margin, pale brown; lamellae close, nearly plane, adnate, brownish becoming black; stem slender, flexuous, hollow, adorned with a few grayish fibrils, pale brown; spores elliptical, .0004 to .0005 in. long, .0002 to .00025 broad.

Pileus 6 to 12 lines broad; stem 1 to 1.5 in. long, scarcely 1 line thick.

"Rich ground in shade of trees." Kansas. July. Bartholomew.

COPRINUS EBULBOSUS.

Pileus thin, campanulate, variegated by the cuticle breaking into broad superficial persistent whitish scales, the surface beneath the cuticle somewhat striate, grayish-brown, the margin at length revolute, lacerated; lamellae narrow, thin, crowded, free, slate color becoming black; stem equal, hollow, white; spores elliptical, .0003 to .0004 in. long, .0002 broad.

Pileus 2 to 3 in. broad; stem 3 to 6 in. long, 2 to 3 lines thick.

Caespitose at the base of cottonwood stumps. Kansas. July. Bartholomew.

This plant resembles *C. picaceous* very closely. New York specimens were formerly referred to it as variety *ebulbosus*, but having now received it from various widely separated localities and finding that it maintains its distinctive characters with constancy, it seems best to consider it a good species. Its peculiar characters are the absence of a bulbous base to the stem and its smaller spores. It also sometimes grows in large tufts. "About fifty grew in a solid clump, all united at the base."

COPRINUS LANIGER.

Pileus thin, conical or campanulate, covered when young with numerous tawny tomentose or floccose scales which partly or wholly disappear with age, sulcate-striate nearly to the apex, pallid, tawny or grayish-ochraceous; lamellae crowded, at first whitish, then brownish-black; stem slightly thickened at the base, minutely downy or pruinose, hollow, white; spores oblong-elliptical, commonly uninucleate, .0003 to .0004 in. long, .00016 broad.

Pileus 6 to 12 lines broad; stem about 1 in. long, 1 to 2 lines thick.

Caespitose at the base of cottonwood stumps. Kansas. July. Bartholomew.

The species resembles *C. micaceus*, from which it is distinguishable by the floccose-squamose coating of the young pileus and by its more narrow spores. Mr. Bartholomew remarks that "it is of slow growth, taking three or four days for development."

THELEPHORA SUBUNDULATA.

Pileus thin, subcoriaceous, centrally depressed, plicate-undulate on the margin, subcinereous or grayish-brown; hymenium slightly uneven, paler than the pileus, grayish or grayish-yellow; stem firm, solid, rarely branched, colored like the pileus; spores broadly elliptical, .0003 in. long, .0002 broad.

Pileus about 6 lines broad; stem 8 to 10 lines long, scarcely 1 line thick.

Ground. Delaware. July. A. Commons.

This species appears to be related to, but much smaller than *T. undulata.* It differs from it in having a glabrous hymenium and larger spores. The stem is not polished, but to the naked eye appears to be priunose-pubescent. Sometimes the margin of the pileus is more than wavy, its folds overlapping.

SECOTIUM DECIPIENS.

Peridium subglobose or depressed globose, its surface rupturing into rather broad, loose or appressed scales, cream-colored, the inferior part at first closely pressed to the stem and sometimes separating from the upper part and forming a kind of annulus, sometimes splitting longitudinally and gradually falling away, leaving the upper part in the form of a pileus; the glebe lamelliform, but variously united and anastomosing, forming irregular and somewhat labyrinthiform cells, free from the percurrent stem, almost or quite black; stem stout, commonly tapering upward, abruptly narrowed as it enters the peridium, firm, solid, externally colored like the peridium, internally tinged with yellow or rhubarb color; spores globose or subglobose, even, black or brownish-black, .0002 to .00028 in. long.

Peridium 1 to 4 in. broad; stem 3 to 6 in. long, 1 in. or more thick at the base, 5 to 10 lines where it enters the peridium.

Streets and lawns. Pasadena, California. April. McClatchie.

The copious blackish spores are an unusual feature in the genus Secotium. The lamelliform septa sometimes rupture in such a way as to form coarse aculeiform processes as in the genus Polyplocium, and thus the plant might easily be referred to that genus. But I find no filamentous capillitium in the specimens before me, and no evidence of a volva, and have therefore referred them to the genus *Secotium*, between which and *Polyplocium* this species forms a connecting link.

MACROSPORIUM AMARANTHI.

Hyphae short, .0008 to .0012 in. long, septate, slightly nodose at the top, forming minute punctiform blackish tufts; spores clavate oblong-clavate or subfusiform, 3- to 8-septate, one to three of the cells with longitudinal septa, .0012 to .0024 in. long, exclusive of the slender pedicel which is commonly shorter than the spore.

Dead spots of leaves of *Amaranthus retroflexus.* Kansas. August. Bartholomew.

The fungus appears to the naked eye to form brownish patches on the spots.

MACROSPORIUM CLEMATIDIS.

Spots small, 2 to 3 lines broad, suborbicular, whitish, gray or brownish, often with a more or less distinct brown border; hyphae amphigenous, caespitose or thinly effused, colored, septate, flexuous, .002 to .004 in. long, .00025 to .0003 broad; spores obovate or subclavate, 3- to 4-septate, commonly constricted at the septa, .001 to .0016 in. long, .0005 broad, the pedicel nearly as long as the spore.

Living or languishing leaves of *Clematis Fremonti.* Kansas. September. Bartholomew.

HEYDENIA FUNGICOLA.

Plant scarcely half a line high, black; receptacle at first elliptical, becoming hemispherical truncate or disciform above and dusted with the spores, about .007 in. broad; stem subcylindrical; spores catenulate, globose or subglobose, colored, .00016 to 0002 in. long.

On old specimens of *Polyporus abietinus* green with incrusting algæ. Maine. Sept. F. L. Harvey.

This was found associated with *Calicium tigillare* which it closely resembles.

Some special phylogenetic Adaptations in Lichens.—I.

BY ALBERT SCHNEIDER.

In a previous paper* I endeavored to show why lichens should be considered as a distinct class of plants. It is my purpose in this paper to discuss briefly some of the special adaptive features which these plants have acquired since their phylogeny as lichens. I shall preface this discussion with a few introductory statements.

Everywhere we can observe a balanced relationship between living organisms and their environment. All structures, no matter where they may occur, or what form they may assume, serve a definite purpose and perform a definite function. In many instances the structural conformations are so "rudimentary" and "imperfect" that we are unable to recognize their physiological significance. It is however unscientific to say that such structures perform no function, because we are unable to recognize a function. It were much more consistent to admit our ignorance and await further investigations, which may clear up some of the difficulties. I make these preliminary statements with special reference to lichens, because many of their structural adaptations have as yet not been satisfactorily explained. I also wish to call attention to the importance and special biologic significance of the tendency among modern scientific botanists to point out the interrelation of structure and function. There is no function without structure: without structure there could be no function.

From this it becomes evident that morphological and physiological investigations must go hand in hand. If we neglect one for the other we fall into a dangerous error, dangerous to the progress of biological science. The time is fortunately slowly passing away when morphology (usually external morphology) alone constitutes the science of life. The herbalists who go into wild ecstacies over having "discovered" a "new species" are slowly giving way to the scientists who are solving or endeavoring to solve some difficult life-problem. The fact that many scientific efforts are fruitless in direct results is not a reason for becoming discouraged ; much less a reason why old fashioned "empiricists" should gloat over these failures and make strenuous efforts to perpetuate the old regime.

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* The Biological Status of Lichens. BULLETIN, 22: 189–198. 1895.

The knowledge gained from a purely morphological study of lichens, is in itself of little practical value if we can not find the correlated physiological interpretation. The scientific study of lichens is of very recent origin. Our knowledge of the physiology of these plants is especially deficient. Sufficient is, however, known in a general way, to enable us to give fairly accurate hypothetical physiological interpretations of most of the anatomical structures.

It is perfectly consistent to suppose that the lichen, during phylogenetic history, has undergone great adaptive changes. This statement is axiomatic and requires no further elucidation. From the nature of things it is also evident that the thallus has undergone the greatest adaptive changes.

As has been known for some time, the thallus in particular performs the function of assimilation, due to the presence of the symbiotic algae. Within recent years, Jumelle * has made a special study of chlorophyllian assimilation in lichens. The special structural adaptations which we are about to discuss are due to the fact that the fungal symbiont, which is incapable of assimilating CO_2, must make suitable concessions to the position and arrangement to the algal symbiont. This we find to be the case. In this paper I shall devote myself to foliaceous thalli and shall briefly consider some of the typical structures met with in such thalli; namely, the epidermal layer, the upper cortical layer, the algal ("gonidial") layer, the medullary layer, the lower cortical layer and the rhizoids. A typical epidermal layer is not present in all foliaceous lichens. It is, however, well developed in *Sticta* and *Stictina*. It consists of hyphal cells, two or three layers in thickness. The cells are placed horizontally and are very closely crowded, thus forming a protection against excessive evaporation. It serves a function similar to the epidermis in higher plants. In the genus *Leptogium* the epidermis consists of a single layer of cells presenting a close resemblance to the cuticle of higher plants. We find a similar cuticular covering in the related genera, *Mallotium*, *Hydrothyria* and *Polychidium*. This structure not only serves the function of an epidermal layer, that is, prevents excessive evaporation, but also a mechanical function, giving greater firmness to the thallus. In other words, the single layer of cells in the above genera of the Collemaceae serves a function similar to the many-layered epidermis and cortical structure in *Sticta*, *Stictina* and other genera.

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*Jumalle H. Recherches Physiologiques sur les Lichens. Revue generale de Botanique, 4: 49-64, 103-121, 159-175, 220-231, 259-272, 305-320. 1892.

The epidermal layer is generally colored, usually a yellowish brown or dark brown. This is no doubt for the purpose of tempering the influence of sunlight. We may safely assume that the epidermal layer serves three functions. Its primary function is to prevent the excessive evaporation of moisture; its secondary functions are to reduce the injurious effect that direct isolation would have upon the symbiotic algae and to aid in protecting the underlying tissues as well as to give additional firmness to the thallus.* Below the epidermis is found the cortical layer, which is usually of considerable thickness in the majority of foliaceous lichens. I will not dwell upon its anatomical structure, as that is sufficiently well known. Its primary function is mechanical. It also serves a function similar to that of the epidermis; it prevents the evaporation of moisture.

According to the principles of mechanics and for the purpose of protection the cortical layer should occur near the upper surface of the thallus. But for physiological reasons the algal layer should also be near the upper surface, that the algae may be acted upon by the sunlight and that they may more readily come in contact with the CO_2 of the atmosphere and that they may readily give up the O which is liberated as the result of assimilation. We actually find such an adaptive relationship between the algal layer and the cortical layer. In many of the foliaceous lichens we find that the algae extend almost to the upper surface of certain circumscribed areas; that is the cortical layer is not of uniform thickness. Such an arrangement enables the algae to take up CO_2 from the atmosphere in exchange for the O liberated. This could, however, not take place, if the epidermis and the upper and lower cortical layers were unbroken or without intercellular spaces. I shall now discuss some of the structural adaptations to meet this requirement.

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* It should be borne in mind that there is no living structure whose function is purely mechanical or purely physiological. "Dead" structures *may* have only a mechanical function.

On the closer examination of a thin vertical section of the thallus, it is found that in many of the foliaceous lichens numerous *intercellular* canals (intercellular spaces) pass from the algal layer through the cortical and epidermal layers. These canals, which resemble the stomata in their physiological function, facilitate the interchange of the gases resulting from the activities of chlorophyllian assimilation. The canals (breathing pores) are much branched and occur most frequently in the thin areas of the upper cortical layer. As a rule, they do not pass to the exterior in a vertical direction. In the epidermal layer they take almost a horizontal course; this is because the cells of the epidermis are elongated horizontally.

In the dry state these canals are practically closed, thus reducing the loss of moisture to a minimum. In the moist state they enlarge considerably, thus enabling assimilation, which is dependent upon the presence of CO_2 and sunlight, to take place. These breathing pores are especially numerous in *Nephromium, Solorina* and *Parmelia.*

Other lichen genera do not have the breathing pores just mentioned. For example they are not noticable in the genera *Sticta* and *Stictina.* In these two genera the epidermal layer is distinct, as has been stated. The upper cortical layer is of uniform thickness and consists of very compact, rather small hyphal cells. The lower cortical layer is comparatively thin and its cells are less closely united; yet they are sufficiently compact that no intercellular spaces can be detected. The question now arises, how are the enclosed algae * supplied with the necessary atmosphere? In my opinion this is done by means of the so-called *cyphellae* which occur on the lower surface of the thallus. These structures have long been known to lichenologists. Haller (1776) was perhaps the first author who called special attention to them. He described them as "white circular depressions." This was about all that was known concerning these structures at that time. Acharius was the first to introduce the term cyphellae, which term has been retained up to the present. Since these organs are little known, it will be well to describe them more in detail.

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* I have purposely substituted the term "algae" for the term "gonidia." Gonidia and related terms as "gonimia," "gonidimia," etc., are meaningless in modern lichenology, and should therefore be rejected.

The cyphellae occur almost exclusively in the genera *Sticta* and *Stictina* and are primarily breaks in the continuity of the lower cortical layer. The hyphae of the medullary layer immediately about the opening in the cortical layer divide more frequently, producing a dense net-work of hyphae or even a semicortical structure. As a rule, the cells of this secondary cyphellar formation extend in a direction at right angles to the outer surface; that is, they assume a suitable position for the conduction of food-substances. The margin of the primary cortical layer (the cortical layer of the thallus) is turned more or less outward. As a rule the algae of the algal layer immediately over the cyphellar opening multiply more rapidly, this causing them to accumulate at these areas.

Two kinds of cyphellae may be recognized. Form 1, as seen in *Stictina damaecornis*. The cyphellar depression is usually circular, concave inward, the margin of the cortex forming an outer constriction. The broken-down cortex of the thallus is replaced by the secondary semicortical formation of the medullary hyphae. Its outer surface is usually smooth, devoid of rhizoids, and generally of a paler color than the primary cortical tissue. They are irregularly distributed over the elevated portions of the lower surface of the thallus; none ever occur in the grooves. They appear first in the older portions of the thallus. In form they are quite constant, in size they decrease toward the younger portion of the thallus.

Form 2, as seen in the majority of *Stictas* and *Stictinas*. It is much more common and differs from the former in the absence of the formation of a secondary semicortical cyphellar covering. Instead of a depression as in the former case, there is usually a protrusion of the densely interwoven network of medullary hyphae. Their form is usually less regular. Their position and arrangement is the same as in the first form.

Both forms of cyphellae are sufficiently large to be seen by the naked eye. No cyphellae occur near the actively growing tip of the thallus.

Acharius applied the term cyphellae to the form first described. Those of the second form he considered to be soredia. Nylander retained the name cyphellae for the first form. The second form he designated as *psuedocyphellae.* There is no morphological or physiological reason why the latter should be designated as "false." Indeed it were more consistent to designate the first form as false since they are of less frequent occurrence. Stitzenberger* retains Nylander's distinction into true and false cyphellae and further subdivides them as to color into white and yellow. This subdivision seems to be valueless, since their color depends upon the color of the medullary hyphae. Stitzenberger considers them of special importance in his classification of the Stictei. I am, however, opposed to adopting as primary, morphological characters whose physiology is unexplained.

Having thus briefly treated of the morphology of cyphellae we will now refer to their probable physiological significance. As already stated, they very likely serve to admit air into the interior of the thallus. Some of the older lichenologists looked upon them as vegetative propagative organs, similar to the soredia. They are not soredia, since they usually contain no algae. That the second form may accidentally contain algae is possible, since we find occasional algae throughout the medullary layer. It is, however, unreasonable to suppose that they would normally contain algae, since their position is not suitable for the development of the symbiotic algae. From the nature of the cortical layers and the epidermis in the majority of Stictei, it is reasonable to assume that the cyphellae serve a function similar to that of the stomata of ordinary foliage leaves. That is, the cyphellae and breathing pores of lichens are functionally similar. If it is scientific to make any comparison of the morphology of lichens and phanerogams it may be stated that the cyphellae are analogous to lenticels.* The tissue which closes the opening in the lower cortical layer is the result of a special cambial or meristematic activity.

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* Stitzenberger, E. Die Gruebchenflechten (Stictei) und ihre geographische Verbreitung. Flora, 81: 88–150. 1895.

* This analogy was pointed out by Dr. Smith Ely Jelliffe at a recent meeting of the Torrey Botanical Club (November 5th).

There is still another adaptive structural feature in the thallus of many lichens, especially in the Stictei, which is of undoubted physiological importance. These lichens present a striking appearance by the numerous ridges and depressions on the upper surface of the thallus. Morphologically and physiologically the ridges are analagous to the vascular system in the true foliage leaves. On microscopic examination it is found that the majority of the medullary hyphae of the ridges extend parallel to the direction of the ridges. In this region the medullary layer is also considerably thickened. It is a structure specialized to conduct the products of assimilation. This wavy outline of the thallus also increases surface expansion, whereby assimilation is increased. Assimilation is most active in the depressed portions of the thallus, which also corresponds to the position of the cyphellae on the lower surface. Such a wavy arrangement of structures also serves a mechanical function; according to the principles of mechanics it affords a better support to the frequently very large thallus.

A Study of the Genus Galactia in North America.

By Anna Murray Vail.

The genus *Galactia* was established by Patrick Browne in Nat. Hist. Jamaica, 298. *pl. 32. f. 2.* 1756. It was based on the plant figured in the illustration, a species with the stamens of *Galactia* and the showy scarlet flowers of *Collaea*, which forms a connecting link between these two sections. Linnæus reduced the genus to *Clitoria*, describing the Jamaica plant under the name of *Clitoria Galactia*.* Michaux in Fl. Bor. Am. 2: 61, revived the genus, with two North American species.

The following genera have been reduced to *Galactia:*

Odonia Bertol. Lucub. Herb. 35. 1822.

Sweetia DC. Mem. Leg. 358. 1823.

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* The synonymy of this species is as follows:

GALACTIA GALACTIA (L.).

Clitoria Galactia L. Sp. Pl. Ed. 2, 1026. 1763.

Galactia pendula Pers. Syn. 2: 302. 1807.

ILLUST. Lindl. Bot. Reg. *pl. 269.* 1818.

Collaea DC. Ann. Sci. Nat. (I.) **4**: 96. 1825.
Betencourtia St. Hil. Voy. **1**: 376. 1833.
Leucodictyon Dalz. in Hook. Kew Journ. Bot. **2**: 264. 1850.
Heterocarpaea Scheele, Linnaea, **21**: 467. 1850.

The genus is accepted as described by Taubert in Engler and Prantl, Nat. Pflantzenf. **3**: part 3, 369, 1894, where some fifty species are credited to the temperate and tropical regions of both hemispheres.

- Stems erect, decumbent or prostrate, *not twining*.
  - Leaves simple; flowers 1–2, sub-sessile in the axils of the leaves. 1. *G. heterophylla.*
  - Leaves 3–foliolate, sometimes simple; flowers 1-several in short-peduncled or sub-sessile, axillary racemes or fascicles. 2. *G. erecta.*
  - Leaves pinnately 3–foliolate or digitately 5-foliolate, with the terminal leafle petioled; flowers 1–4, peduncled. 3. *G. Grayi.*
  - Leaves 3-foliolate.
    - Stems erect, branched; leaflets oblong-linear; flowers few, approximated near the top of the rhachis. 4. *G. brachypoda.*
    - Stems prostrate; leaflets oval or oblong-oval; flowers numerous, showy, scattered often the whole length of the rhachis, or in var. *longeracemosa* mostly near the top. 5. *G. Floridana.*
- Stems *twining*, prostrate or climbing on bushes.
  - Leaflets 3.
    - Racemes 2–7, usually fascicled, in the axils of the leaves.
      - Racemes many-flowered, single or branched, as long as or longer than the short-petioled leaves; leaflets round-oblong or sub-orbicular, densely canescent. 6. *G. fasciculata.*
      - Racemes simple, 5–18 cm. long, flexuous and twisted; leaves long-petioled; leaflets oblong or oblong-orbicular, canescent. 7. *G. canescens.*
    - Racemes solitary or with a smaller, or rarely with 2 accessory ones.
      - Racemes as long as the leaves, few-flowered, or the upper flowers solitary in the axils; leaflets broad, oval, thinnish. 8. *G. Texana.*
      - Racemes as long as or somewhat longer than the leaves; leaflets glabrate or nearly so; leaves and rigid racemes erect on the prostrate or climbing stem. 9. *G. regularis.*
      - Racemes usually much exceeding the leaves or in some forms of *G. volubilis* shorter than the leaves.
        - Leaflets ovate-oblong, more or less pilose on both surfaces, rarely nearly glabrate; in var. *intermedia* linear or linear-oblong. 10. *G. volubilis.*
        - Leaflets oval, villous; peduncles stout, hirsute, much elongated: flowers bright rose-purple. 11. *G. mollis.*
        - Leaflets ovate-oblong, coriaceous, bright yellow-green; legume hirsute, the broad suture glabrous at maturity. 12. *G. Cubensis.*

Leaflets oblong-linear, more or less silvery canescent.
13. *G. Wrightii.*

Leaflets 7–9, elliptical-oblong; flowers white, tinged with red.
14. *G. Elliottii.*

1. **Galactia heterophylla** (Gillies).

Procumbent from a ligneous somewhat fusiform creeping rhizome; stems sub-simple, flexuous, 1–3 dm. long, minutely retrorse-hirsute, becoming glabrous, obscurely angled above; stipules 2–3 mm. long, subulate or setaceous; petioles 4-6 mm. long; leaves few, the basal ones 2–4 cm. long, oblong, the others 3–9 cm. or more long, oblong-lanceolate or linear, acutish at each end, coriaceous, glabrous above, the reticulated veins confluent with the conspicuous marginal nerve and minutely strigose beneath; flowers 1–16 cm. long, rose-purple, on 1–3 mm. long pedicels or 1–3, minutely pedunculate in the axils of the upper leaves; bracteoles minute, setaceous; calyx 6–7 mm. long, campanulate, strigose-hirsute, the acuminate teeth somewhat scarious-margined, the broadly ovate-lanceolate upper one minutely 2-toothed, the others more slender, the middle one the narrowest and longest; vexillum with a conspicious indentation at the apex, minutely biappendiculate at the base, abruptly tapering to the filiform claw; anthers oblong-ovoid; legume 2.5–3.5 cm. long, 4–5 mm. wide, coriaceous, acuminate, retrorsely hirsute and puberulous, with a somewhat raised suture. Mature seeds not seen.

Original locality, El Rio Quarto, west side of Las Pampas, Argentine Republic.

Type, Gillies in Herb. Arnott, fide Torrey & Gray.

Eastern Texas, Central America. Uruguay and Argentine Republic.

SYNONYMY: *Cologania heterophylla* Gillies; Hook. & Arn. in Hook. Bot. Misc. 3: 181. 1833.

Galactia marginalis Benth. Ann. Wien. Mus. 2: 126. 1838.

2. **Galactia erecta** (Walt).

Erect from a slender ligneous somewhat fusiform rhizome, stems often several from the same root, 2–3 dm. or more high somewhat flexuous, glabrous or nearly so, angled above; stipules 2–3 mm. long, subulate; leaves few, usually remote; petioles 2–5 cm. long, slender; leaflets 2.5–4 cm. long, often reflexed on the rhachis, oblong, oblong-linear or linear, obtuse, rarely acutish, coriaceous, glabrous, glaucous and the veins reticulated beneath, the terminal one subsessile; flowers 8–10 mm. long, purplish, 2–5 in obscurely peduncled, axillary racemes or fascicles; pedicels

1–2 mm. long; bracteoles setaceous, 1–2 mm. long; calyx turning brown, 5–6 mm. long, hirsute, scarious-margined, the lower teeth slender, acuminate, the upper one broader, minutely 2-toothed; vexillum round-ovate, retuse; legume linear-oblong, about 2 cm. long, hirsute; seeds about 6. June–August.

Original locality, "Carolinas."

Dry pine barrens, North Carolina to Florida, Alabama and Louisiana.

SYNONYMY: *Ervum erectum* Walt. Fl. Car. 187. 1788.

Glycine stricta Hook. & Arn. in Hook. Comp. Bot. Mag. **1**: 22, 1835.

Galactia sessiliflora Torr. & Gray, Fl. N. Am. **1**: 288; 687. 1838.

3. Galactia Grayi.

Decumbent, canescent-sericeous throughout; stems slender, several from a large, thick, ligneous root, retrorsely strigose, 3–6 dm. or more long, simple or branched; stipules minute, subulate; petioles 1–2.5 cm. long, canescent-strigose; leaflets 7–16 mm. long, oblong, sub-cuneate or nearly linear, obtuse, retuse, mucronulate or acutish, emarginate, when 5-foliolate, the terminal leaflet short petioluled, the accessory ones affixed to the lateral pair; sessile or nearly so; racemes 1–4-flowered; peduncles 1–2.5 cm. long; bracteoles minute; pedicels 5–7 mm. long; flowers 1.5–1.8 cm. long; calyx 8–10 mm. long, the teeth slender, acuminate, the slightly broader, upper one minutely 2-toothed; vexillum yellowish, oblong-ovate, retuse, acute at the base, the other petals rose-purple, the keel conspicuously longer than the narrow wings; anthers oblong; legume about 8 cm. long, 5 mm. wide, linear-oblong, acute; seeds 3–4 mm. long, oblong, apparently truncate at the ends.

Original locality, on the Llano River, Texas.

Type, Lindheimer No. 591 in Herb. Columbia College.

Texas, Llano River; San Diego (Miss Croft); Pena and Chenate Mts. (Nealley).

SYNONYMY: *Galactia heterophylla* A. Gray, Bost. Journ. Nat. Hist. **6**: 171. 1850. Not *G. heterophylla* (Gillies.)

4. Galactia brachypoda Torr. & Gray, Fl. N. Am. 1: 288. 1838.

Erect, stems slender, branched, at length decumbent, somewhat puberulous, or nearly glabrous, slightly angled and channelled above, 4–6 dm. long; stipules 2–4 mm. long; leaflets 2–

35 cm. long, oblong or linear-oblong, thinnish, obtuse or emarginate, glabrous or minutely appressed-hirsute above, paler, somewhat strigose or glabrate beneath, the lateral ones very short petioluled or nearly sessile; flowering racemes usually shorter than the leaves, at length elongated; flowers rose-purple or purple, 8–10 mm. long, sessile or very short pedicelled; bracteoles minute; calyx 5 mm. long, clothed with spreading, yellowish hairs, the lower lobes acutish, the middle one somewhat the longest, the broader upper one, minutely 2-toothed; vexillum 7–8 mm. long, round-ovate, apparently not indented at the apex and paler in color than the other petals, the filiform claw 1 mm. long; anthers very small, round-oblong. Legume not seen. July–August.

Original locality, Middle Florida.

Type, Chapman in Herb. Columbia College.

Dry pine barrens, Middle Florida.

5. **Galactia Floridana** Torr & Gray, Fl. N. Am. 1: 228. 1838.

Prostrate, the whole plant hoary-pubescent; stems 2 dm.–1 m. or more long, simple or branched, the upper part often densely and retrorsely white-tomentose; stipules 2 mm. long, setaceous; internodes usually shorter than the leaves; petioles 1–2.5 cm. long, angled; leaflets 1.5–4.5 cm. long, oval or oblong-oval, obtuse, rarely acutish, usually mucronulate, thick and coriaceous, reticulated and paler beneath, the basal ones often one-foliolate; racemes 4–9 cm. long, rarely longer than the leaves, usually many-flowered; flowers 1.2–1.5 mm. long, showy, rose-purple, approximated often the whole length of the rhachis; bracts minute, setaceous; bracteoles close to the base of the calyx; calyx 7–8 mm. long, the teeth scarious-margined, long-acuminate, the upper one entirely or obscurely 2-toothed, the middle lower one considerably longer; vexillum obovate, rounded above, acute at the base, the claw broad and flat; anthers linear-oblong, acute at each end; legume 4–5 cm. long, 4–5 mm. wide, linear, acuminate, tomentose. Mature seeds not seen. June–August.

Original locality, Tampa Bay, Florida.

Type in Herb. Columbia College. Florida..

5a. **Galactia Floridana microphylla** Chapm Fl. S. States, 108. 1884.

Smaller; petioles 5–8 mm. long; leaflets 1–2 cm. long, acutish or obtuse, mucronulate, the few flowers almost sessile in axillary clusters. Flowers and legumes not seen.

Original locality, Florida.

Type in Herb. Columbia College.

Florida.

5*b*. **Galactia Floridana longeracemosa** n. var.

Stouter, the leaves and racemes erect on the prostrate stems; leaflets 2.5–4.5 cm. long, 2–3 cm. wide, oval-oblong, conspicuously retuse, glabrate above, somewhat strigose-pubescent beneath; flowers 1.2–1.5 cm. long, bright rose-purple, 2–4 together at regular intervals above the middle of the rhachis; calyx becoming glabrate. Legume not seen.

Florida. J. H. Simpson. 1889.

6. **Galactia fasciculata** n. sp.

Prostrate or climbing high on bushes; stems 1-2 m. or more long, terete, clothed with a close fine retrorse-canescent tomentum; stipules minute, subulate; internodes longer than the leaves, 4–6 cm. or more; petioles 5–10 mm. long; leaflets round-oblong or sub-orbicular, 1.5–3 cm. long, 1.5–2.5 cm. broad, retuse; finely appressed silky-pubescent above, appressed silky-villous and paler beneath; racemes several, fascicled in the axils of the leaves, forming conspicuous clusters at the slightly enlarged nodes; flowers pale lilac-purple, 1.5 cm. long, solitary or two together, scattered along nearly the whole length of the somewhat flexuous rhachis; bracts minute; bracteoles 1 mm. long, subulate, acuminate, close to the base of the calyx; calyx 8 mm. long, clothed with short, white, silky hairs, the lobes acuminate, the upper one apparently entire, the middle lower one the longest; vexillum 1.5 cm. long, oblong-obovate, tapering to the base of the claw, obtuse or acutish at the apex, the wings very slender; authers linear-oblong, obtuse. Legume not seen.

Conspicuous for its roundish leaflets, and its numerous fascicled often branched and flexuous racemes.

Type, Nash, no. 2480 in Herb. Columbia College, from Tampa, Florida.

7. **Galactia canescens** (Scheele) Benth. Ann. Wien. Mus. **2**: 126. 1838.

Prostrate, creeping on the ground, canescent throughout, many of the racemes becoming subterranean and bearing globular 1-seeded pods: stems several from the same slender, ligneous root, branched at the base; stipules 1–2 mm. long, subulate; internodes 1–15 cm. long; petioles 3–7 cm. long; leaflets 2–4 cm. long, 1.5–3 cm. wide, broadly ovate or oval, retuse, thick and coriaceous, slightly hirsute above, silky canescent-pubescent, much whiter and the veins reticulated beneath; peduncles slender, elongated, few-flowered; bracts and bracteoles minute, subulate;

calyx silky-hirsute, the teeth acuminate; corolla rose-purple?; vexillum obovate; subterranean pods 8 mm. long and broad, reticulated, emarginate, appressed-hirsute, the seeds 6 mm. long, 4 mm. wide, ovoid-elliptical, slightly rounded at the ends, light brown, the other pods 2–3 cm. long, 6–7 mm. wide, linear-oblong, acute, tapering to the base, densely pubescent or tomentose, the seeds elliptical-oblong, mature ones not seen.

Original locality, Texas.

Type, Lindheimer, No. 370.

Sandy ground, Texas.

SYNONYMY: *Heterocarpaea Texana* Scheele, Linnaea **21**: 468. 1850.

8. **Galactia Texana** (Scheele) A. Gray, Bost. Journ. Nat. Hist. **6**: 170. 1850.

Procumbent from a ligneous root; stems slender, long, conspicuously twining, retrorse-pubescent or hirsute; stipules minute, caducous; petioles 1–4 cm. long, slender; leaflets 2.5–5 cm. long, 2–3.5 cm. wide, oval, retuse, mucronulate, minutely appressed-cinereous-puberulous or glabrate above, appressed sericeous or sparingly villous beneath, thin, becoming slightly coriaceous; racemes few-flowered, much shorter than the leaves; flowers not seen; calyx 5 mm. long, the teeth attenuate; legume slightly falcate, 4–5 cm. long, 5–6 mm. wide, acute at each end, appressed-hirsute; seeds 5–7, 5 mm. long, elliptical, truncate at the ends, light brown.

Original locality, near New Braunfels, Texas.

Type, Lindheimer. Confined to Western Texas.

SYNONYMY: *Lablab Texanus* Scheele, Linnaea, **21**: 467. 1848.

/ 9. **Galactia regularis** (L.) B. S. P. Prel. Cat. N. Y. 14. 1888.

Prostrate and climbing on bushes, from a stout, ligneous root; stems 4 dm.–1 m. long or more, terete, minutely retrorse-pubescent, becoming glabrate; internodes about the length of the leaves; stipules minute, subulate; petioles 1–3 cm. long; leaflets 2–4.5 cm. long, rather rigid, elliptical-oblong, or ovate-oblong, obtuse, rarely acutish, often retuse and apiculate, emarginate, glabrous above, somewhat appressed-hirsute or pilose and lighter beneath; racemes 3–9 cm. long, usually rigid, and, with the leaves erect on the prostrate stem, the smaller accessory ones only occasional; flowers violet-purple, showy, often scattered the whole length of the rhachis; bracts small; bracteoles subulate, 1–2 mm. long; calyx 6–9 mm. long; glabrate or with a few scattered hairs, conspicuously acuminate in bud, the teeth slender, obscurely scarious-margined, the upper broader one entire; vexillum obtuse or acutish, tapering to the flat claw, with an obscure, brownish spot below the middle; anthers linear-oblong, acute at each end; legume 3.5 cm. long, 4–5 mm. wide, linear, acutish at each end, appressed-hirsute, becoming glabrate; seeds about 3 mm. long, oblong-orbicular, brown. June–August.

Original locality, Virginia.

Type, in Herb. Mus. Brit.

Pine barrens and sandy woods, Southern New York to Florida and Mississippi.

SYNONYMY: *Dolichos regularis* L. Sp. Pl. 726. 1753.
Ervum volubile Walt. Fl. Car. 187. 1788.
Galactia glabella Michx. Fl. Bor. Am. **2**: 62. 1803.
Galactia Purshii Desv. Ann. Sci. Nat. **9**: 413. 1826.

ILLUSTRATIONS: Hill, Veg. Syst. **21**: *pl. 19.* 1772.

A slender, smaller leaved form of this species has been collected at Aiken, S. C., by H. W. Ravenel.

10. * **Galactia volubilis** (L.) Britt. Mem. Torr. Club, **5**: 208. 1894.

Prostrate and climbing on bushes, from a slender, ligneous root; stems 4 dm.–1 m. or more long, retrorsely and finely hirsute; stipules minute, subulate; petioles 1–5 cm. long; leaflets 2–5 cm. long, ovate-oblong or rarely lanceolate-oblong, obtuse, often retuse, mucronulate, rarely acutish, glabrous or somewhat pilose above, lighter, minutely pubescent or pilose beneath; racemes 2 or 3 cm.–2.4 dm. long, often slender and filiform; flowers 8–10 mm. long, lilac or pink-purple; bracts and bracteoles minute; calyx 6–8 mm. long, attenuate in bud, glabrate or somewhat pilose, the lobes nearly equal, slender; vexillum obovate, rounded above, biappendiculate at the base, claw slender; legume 3–5 cm. long, 4–5 mm. wide, acute at each end, linear or linear-oblong; seeds 6–9, when mature nearly as wide, truncate at each end, brown, with black markings. May–August.

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* This species is based on the Dillenius plate cited below and is most variable and difficult to define. The type specimen is evidently the larger leaved, long-racemed form that occurs principally from North Carolina to Florida on the coast, and has been confounded with *G. mollis* Michaux. The more northern plant has usually shorter racemes, the upper part of which often falls off before maturity of the fruit, which gives the appearance of very short, sometimes sessile racemes. It has in its more southern limits been confounded with *G. tenuiflora* (Willd.) Wight and Arn. An original type specimen of Wight Nos. 874 and 875 from Colemala, East Indian Peninsula preserved in Herb. Columbia College differs materially from the North American plant. *G. tenuiflora* occurs in South America and is referred in Index Kewensis to *G. dubia* DC. Prod **2**: 238. *Galactia Macreei*, the type specimen of which is preserved in Herb. Columbia College, is merely a very slender filiform-racemed variation.

Original locality, "America Septentrionali."

Long Island to Florida, west to Pennsylvania, Tennessee and Texas.

SYNONYMY: *Hedysarum volubile* L. Sp. Pl. 750. 1753.

Galactia mollis Nutt, Gen. **2**: 117. 1818. Not Michaux.

Galactia pilosa Ell. Bot. S. C. & Ga. **2**: 238. 1824. Not Nuttall.

Galactia Macreei M. A. Curtis, Bost Journ. Nat. Hist. **1**: 120. 1837.

Galactia villosa Eat. & Wright, N. Am. Bot. 248. 1840. Not Wight & Arnott.

ILLUSTRATIONS: Dill. Elth. 173. *pl. 43. f. 170.* 1732.

Hill, Veg. Syst. **21**: *pl. 43. f. 4.* 1772.

10a. **Galactia volubilis Mississippiensis** n. var.

Leaflets oval or oval-oblong, pilose on both surfaces, lighter beneath, mostly retuse; racemes slender, varying in length; flowers slightly smaller, pale lilac; legume 3–4 cm. long. Otherwise as in the type.

Missouri, Arkansas, Indian Territory and Louisiana.

An oval, pilose-leaved form that in Missouri seems very distinct, but specimens from other localities seem to intergrade with the broader leaved form of the type.

10b. **Galactia volubilis intermedia.**

Very slender; leaflets linear or linear-oblong; racemes filiform, the flowers on the upper portion often sessile in the axils of the leaves; legume 2–3 cm. long.

Florida to Louisiana.

SYNONYMY: *Galactia pilosa γ angustifolia* Torr. & Gray, Fl. N. Am. **1**: 287. 1838. Not *G. angustifolia* Kunth.

A very slender form, intermediate between the type and *G. angustifolia* Kunth, or what passes as such.

11. **Galactia mollis** Michx. Fl. Bor. Am. 2: 61. 1803.

Prostrate or climbing, villous and somewhat hoary throughout; stems several from the same slender root, simple or branched; the racemes and petioles mostly erect on the decumbent stems; stipules subulate 1–2 mm. long; petioles 2, rarely 5 cm. long; leaflets 2.5–5 cm. long, oval or oblong, obtuse or emarginate at both ends, sometimes retuse, the upper ones often acutish, bright, light green, scabrous and villous above, villous and paler beneath, the young ones densely tomentose, the lateral ones usually rounded at each end, the terminal one more tapering at the base; racemes solitary 1–2 dm. or more long; flowers acute in the bud, bright red or rose-purple, short pedicelled, approximated near the summit of the short peduncle, bracts setaceous, minute, bracteoles subulate, 1.5 mm. long; calyx about 6 mm. long, densely villous, the broader upper tooth entire, nearly equalling the more slender lower ones; vexillum obovate, rounded above, tapering to the obscurely biappendiculate base, keel-petals paler in color and considerably smaller than the slender wings; legume 2.5–3.5 cm. long, 4.5–5.5 mm. wide, linear-oblong, acutish, densely tomentose; seeds ovoid, acutish, brown. July–August.

Original locality, "Carolina inferiore."

Type, in Herb. Michaux.

Dry, sandy pine lands and swamps, North Carolina to Florida.

SYNONYMY: *Galactia pilosa* Nutt. Gen. 2: 116. 1818. Not Elliott.

A very slender form of the above species with narrower leaflets, which are obscurely scabrous or glabrate above and less villous beneath, occurs in Florida.

12. **Galactia Cubensis** H. B. K. Nov. Gen. 6: 429. 1823.

Climbing high on shrubs and trees; stems terete, retrose-pubescent, becoming often nearly glabrate; stipules 2–3 mm. long, subulate; petioles 1–3 cm. long; stipels 2 mm. long, setaceous, 2 mm. long, often persistent; leaflets 2.5–8 cm. long, oblong, oblong-oval or elliptical, obtuse and emarginate at both ends, thick, rigid and coriaceous, glabrous and finely reticulated above, pubescent, paler and reticulated beneath; racemes mostly longer than the leaves, 5 cm.–1.4 dm. long; flowers 10–12 mm. long, pale purple, sessile or nearly so, solitary or two, opposite at regular intervals often the whole length of the rhachis; calyx 5–6 mm. long, the lobes attenuate, pubescent; vexillum obovate; legume 4–5 cm. long, 5–6 mm. or more wide, acutish, hirsute, at length glabrate, the conspicuous, raised sutures glabrous; seeds 6–10, 3–4 mm.

long, oblong, ovoid, brown, mottled with black. Very variable. March–December.

Original locality, near Havana, Cuba.

Keys, Florida, West Indies; also in Central America.

Synonymy: *Galactia spiciformis* T. & G. Fl. N. Am. 1: 287. 1838.

13. **Galactia Wrightii** A. Gray, Pl. Wright. 1: 44. 1852.

Sub-erect or decumbent; stems several from the same lignescent root, branched from the base, cinereous with a fine, white, appressed, retrose pubescence; stipules 1–2 mm. long, subulate or setaceous; petioles 1–4 cm. long; leaflets oblong or oblong-linear, 2–5 cm. long, obtuse, mucronulate, less canescent above than beneath, rarely becoming glabrate above; racemes many-flowered, 5–15 cm. long, the lower ones longer than the upper ones; flowers purplish, about 1 cm. long, sessile or nearly so, 2–3, fascicled at mostly regular intervals along the upper portion of the rhachis; calyx 5–7 mm. long, sericeous, the lobes acute, the middle lower one attenuate and longer; vexillum 7–10 mm. long, obovate, retuse, tapering to the biappendiculate base; legume 3–4 cm. long, 4 mm. wide, sericeous, acute at each end, 4–7 seeded. Mature seeds not seen. July–October.

Original locality, Hills near Limpia, Texas.

Type, Wright No. 111. 1849.

Extreme western Texas and adjacent New Mexico and Mexico.

Synonymy: *Galactia tephrodes* A. Gray, Pl. Wright. 2: 34. 1853.

14. **Galactia Elliottii** Nutt. Gen. 2: 117. 1818.

Prostrate and climbing high on brushes; stems branched, 1–3 m. long, from a long, branched, lignescent rhizome, angled, channelled, striate and somewhat retrorse-hirsute; stipules minute, subulate; petioles 2-5 cm. long; leaflets 2–3 cm. long, elliptical-oblong, obtuse, somewhat retuse, mucronulate, coriaceous, glabrous and shining above, pubescent beneath; racemes longer than the leaves, 1–3 dm.; flowers 10–12 mm. long, white, tinged with red, 2 or 3 together, fascicled at regular intervals along the upper part of the rhachis; bracts and bracteoles minute; calyx about 7 mm. long, appressed-hirsute, the lobes slender, attenuate, vexillum obovate, obtuse or acutish, obscurely biappendiculate at the base; legume 3–4 cm. or more long, 1 cm. wide, oblong, acutish, emarginate, tomentose; seeds 3–5, about 5 mm. long, ovoid, blackish, smooth and shiny.

Original locality, South Carolina.

Dry soil and pine lands, South Carolina to Florida, near the coast.

SYNONYMY: *Galactia pinnata* Muhl. Cat. 65. 1813. Not Persoon, 1807.

Tephrosia Elliottii Benth. Ann. Mus. Wien **2**: 127. 1838.

14a. **Galactia Elliotti Leavenworthii** Torr. & Gray. Fl. N. Am. 1: 687. 1838.

Silky pubescent or villous throughout.

Type in Herb. Columbia College.

Florida, Leavenworth; Lake Co., Nash.

New or noteworthy American Grasses.—III.

BY GEO. V. NASH.

EATONIA NITIDA (Spreng.).

Aira nitida Spreng. Fl. Hal. Mant. **1**: 32. 1807.

Aira Pennsylvanica Spreng. Mem. Acad. St. Petersb. **2**: 299. *pl.* 7. 1810.

Aira mollis Muhl. Gram. 82. 1817.

Eatonia Dudleyi Vasey, Coult. Bot. Gaz. **11**: 116. 1886.

Sprengel in his description of *Aira nitida* describes the leaves as 1′ long and pubescent at the base. These are characters which are peculiar to the plant known as *Eatonia Dudleyi* Vasey, which is very common in Pennsylvania, the region from which Sprengel's plant came. The *Aira Pennsylvanica* Spreng. is certainly the *Eatonia Dudleyi* Vasey. The figure cited above well represents this species.

The more prominent characters which appear to separate this plant from the *Eatonia Pennsylvanica* (DC.) A. Gray, are: The almost constant pubescence of the sheaths, at least the lower ones; the slender culm; the short, often pubescent leaves; and the broader first scale, which is about one-third the width of the second.

PUCCINELLIA AIROIDES (Nutt.) Wats. & Coult. in A. Gray, Man. Ed. 6, 668. 1890.

Poa airoides Nutt. Gen. **1**: 68. 1818.

Glyceria distans var. *airoides* Vasey, Cat. Grasses U. S. 87. 1885.

Panicularia distans airoides Scribn. Mem. Torr. Club, **5** : 54. 1894.

This plant appears to be specifically distinct from the *P. distans* Parl. The taller and more slender culms, the panicle-branches dividing nearer the extremities, the fewer and less crowded spikelets, and the comparative length of the empty and flowering scales serve well to distinguish it. In *P. distans*, a coast plant, the second empty scale is less than one-half as long as the flowering ones; while in *P. airoides*, a plant of the western interior, it exceeds one-half the length of the flowering scales.

Puccinellia angustata (R. Br.).

Poa augustata R. Br. App. Parry's Voy. 287. 1824.

Glyceria angustata Fries, Mant. **3** : 176. 1842.

Panicularia angustata Scribn. Mem. Torr. Club, **5** : 54. 1894.

Bromus Porteri (Coulter).

Bromus Kalmii var. *Porteri* Coulter, Man. Rocky Mt. Region, 425. 1885.

Culms 1½°–3° tall, erect, simple, pubescent below the nodes. Sheaths shorter than the internodes, glabrous or sometimes softly pubescent; ligule ½″ long, truncate; leaves 1″–3″ wide, rough, those of the culm 4′–9′ long, the basal narrow and about one-half of the length of the culm; panicle 3′–6′ in length, its branches drooping and flexuous, at least when old, the nodes of the axis pubescent; spikelets 5–10-flowered, 9″–15″ long, on slender flexuous pedicels; empty scales pubescent, the first narrower than the second, both 3-nerved; flowering scales 5″–6″ long, obtuse, 5–7 nerved, densely pubescent with long silky hairs; awn 1″–2″ long.

In dry soil, South Dakota to Montana, south to western Nebraska, New Mexico and Arizona.

This plant is readily distinguished from *B. Kalmii* by its 3-nerved second scale and longer flowering scales. In *B. Kalmii* the second scale is 5–7-nerved and the flowering scale about 4″ long.

Notes on Some Southern Cassias.

By Charles Louis Pollard.

(Plates 250–252.)

The Chamaecristoid Cassias have always been recognized as a group of great perplexity within a genus of otherwise clear delimitations. Even Bentham, whose careful monographic work is still our standard authority on this genus, admits that his treatment of the Chamaecristae verae is far from satisfactory.* The difficulty is due to the close relationship which the species exhibit, and to the consequent fact that specific distinctions throughout the group are hardly obvious in a superficial examination. I am convinced, however, that differences in the periods of flowering and fruiting, as well as in geographical range, will afford characters by which our American species may be satisfactorily separated. The recent collections of Messrs. A. H. Curtiss and G. V. Nash, in Florida, have contributed much toward a clearer comprehension of this essentially Southern group.

The Chamaecristae verae fall naturally into two divisions: those with small or minute, and those with relatively large flowers; and the general tendency among American botanists has been to refer all plants belonging to the first division to *C. nictitans*, while all large-flowering forms were unhesitatingly classed with *C. Chamaecrista.* Muhlenberg was probably the first to recognize that the South contained more than two species and he accordingly named the hirsute plant which grows in dry fields in Florida *Cassia aspera.*† This was reduced by Torrey and Gray ‡, but has been quite generally recognized in recent years as a perfectly valid species. Twenty years before this Michaux had described what he took to be a new Cassia, under the name of *C. fasciculata;*‖ but this was referred by Bentham, who had access to Michaux's type in Paris, to *C. Chamaecrista*, and it probably belongs there.

After a critical study of numerous specimens I have reached the conclusion that the true *C. nictitans* of the North does not extend into Florida; a theory that seems to be confirmed by numerous field observations kindly communicated to me by Mr.

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*Trans. Linn. Soc. London, 27: 536. 1871. † Ell. Bot. S. Car. & Georg. 1: 474. 1821. ‡ Torr & Gray. Fl. N. Am. 396. 1838. ‖ Fl. Bor. Am. 1: 262. 1803.

Nash. It is replaced by *C. aspera*, a plant of dry barren fields and by a multipinnate, rather tall growing plant, hitherto unnamed, distributed as *nictitans*, but certainly not referable to that species.

C. Chamaecrista grows in Florida, assuming an erect, bushy habit, and often attains a height of from two to three feet. It is associated with another undescribed species, of low growth and divaricately much branched. The technical distinctions between these two new species will be discussed in the subjoined descriptions; but the differences shown in the flowering period are worthy of special note.

Cassia nicticans flowers in August throughout the North and somewhat earlier south of the Virginia line. Its Florida congener is barely in flower by the middle of August, while flowering specimens collected by Mr. Curtiss bear date of September 15, at which time *nictitans* has withered foliage and thoroughly mature pods. *C. Chamaecrista* flowers from May 1 to 15, in Florida, and throughout June at the North; the new allied species was collected by Mr. Nash on September 5, with no pods as yet formed.

These data are remarkable and quite conclusive. It is natural to find a plant of northern range blooming a week or even a month *earlier* in a more southerly latitude; but it is not to be supposed that a plant whose flowering period extends through May and June should assume an autumnal form in the South, especially when we bear in mind the fact that all these Cassias are annuals, and hence can bloom normally but once in a season. It is of course barely possible that *C. Chamaecrista* ripens its fruit in June and presents well developed plants two or three feet in height in late August; in case careful field observations should prove this to be a fact, we shall have a most remarkable case of dimorphism in a single species.

The following key presents the salient characters of the Chamaecristae verae in North America. *C. cinerea* Cham. and Schlecht., a species of Texano-Mexican distribution simulates this group, but belongs in the series Dimidiatae.

KEY TO THE SPECIES.

Flowers large (exceeding 1 cm.).
  Leaves glabrous.
    Plants tall, erect. *C. Chamaecrista.*
    Plant low, diffusely branched. *C. depressa.*

Leaves pubescent.	
Leaflets linear falcate, appressed.	*C. procumbens.*
Leaflets elliptical, spreading.	*C. mississippiensis.*
Flowers small (not exceeding ¾ cm.).	
Plants strongly hirsute.	
Leaves 8–12-foliolate.	*C. simpsoni.*
Leaves 20–24-foliolate.	*C. aspera.*
Plants glabrate or pubescent.	
Leaflets narrow, 20–25.	*C. multipinnata.*
Leaflets broad, 8–14.	*C. nictitans.*

CASSIA MULTIPINNATA n. sp.

Slender, tall, erect, more or less branched; stem slightly woody at base, pubescent; leaves lanceolate-elliptical in outline, 20–25-foliolate, the rhachis obscurely strigose-pubescent; leaflets 10 mm. long, 1½ mm. wide, glabrous, narrowly linear, cuspidate, the mid-vein approximating the outer margin; petiolar gland minute, depressed-cupuliform, substipitate; stipules long-acuminate, striate, foliaceous; flowers scattered, sessile, the corolla quite irregular, its small yellow petals not much exceeding the narrow, scarious-edged sepals; legume linear, compressed, pubescent or even hirsute, dorsally and ventrally dehiscent, elastic, 2 to 2½ cm. long seeds 4 to 6, oblique. (Plate 250.)

Near Jacksonville. A. H. Curtiss, North American Plants. No. 512, distributed as *C nictitans* and *C. nictitans* var. *aspera;* second distribution, No. 5157, September 15, and October 27, 1894. Tallahassee. G. V. Nash, No. 2403, August 12, 1895.

This is separable from *nictitans* by the narrowly linear, very numerous leaflets, the more hairy pod, and the late period of flowering. The irregular corolla, noticeable in some other members of this group of Cassia, but not often commented on, is here very prominent, one petal greatly exceeding the others.

CASSIA MULTIPINNATA NASHII n. var.

Differs from the erect type in being of low, diffusely spreading habit.

Collected in low pine woods, River Junction, Gadsden Co., Florida, by Mr. Nash, September 5, 1895 (no. 2577).

CASSIA DEPRESSA n. sp.

Low and spreading, but not prostrate, divaricately much branched; stems obscurely strigose-pubescent; leaflets 6 to 10 pairs, linear-elliptical, glabrous, 9 mm. long, 2 to 3 mm. broad, with the excentric midrib of *C. Chamaecrista;* petiolar gland small, circular, sessile, depressed; flowers solitary on filiform mostly supra-axillary peduncles; petals large, obovate, much exceeding the sepals, 1½ cm. long, 1½ cm. broad; sepals linear, scarious, strongly ciliate; legume not observed. (Plate 251.)

Low pine woods, River Junction, Gadsden Co., Florida. G. V. Nash, September 5, 1895 (no. 2571).

Potosi, Missouri. F. Pech.

The difference between this and *C. Chamaecrista* lies mainly in its aspect, but the leaflets are smaller and less numerous and the flowers are relatively much larger. The flowering period, moreover, is from two to three months later than in that species.

Cassia Mississippiensis Pollard, Bull. Torr. Club, **21**: 219. 1894.

This plant has not yet been collected, so far as I am aware, outside of the State from which it was first described. Professor S. M. Tracy, of the Mississippi Agricultural Experiment Station, wrote me that he had four acres covered with a dense growth of the species; from which I infer that it is locally as troublesome a weed as *C. nictitans.*

Cassia Simpsoni Pollard, Bull. Torr. Club, **21**: 221. 1894.

Apparently a subtropical type, confined in the United States to the Keys of Florida, but probably growing in Cuba. It may be considered, in fact, the West Indian representative of the Texano-Mexican species *C. procumbens* L. The original specimens, collected by Mr. J. H. Simpson, on No Name Key, are in the possession of the National Herbarium. I have detected it in no other collection thus far examined.

Explanation of Plate 252.

Fig. 1. Cassia nictitans L.
Fig. 2. Cassia aspera Muhl.
Fig. 3. Cassia multipinnata Pollard, n. sp.
Fig. 4. Cassia Simpsoni Pollard.
Fig. 5. Cassia Chamaecrista L.
Fig. 6. Cassia depressa Pollard, n. sp.
Fig. 7. Cassia Mississippiensis Pollard.
Fig. 8. Cassia procumbens L.

Calamagrostis scopulorum Jones.*

Last spring, when Mr. Jones was engaged in naming his collection of Utah plants at the National Herbarium, his specimens of *Calamagrostis* were submitted to me for determination, as I am engaged in revising the North American species of that genus. I mentioned to Mr. Jones that the species in question was doubtless an undescribed one, and requested that the specimens be left with me for further study. Mr. Jones told me that he would have to take the specimens away then to catalogue them, but gave me the impression that I should have an opportunity to examine them later on. Since then I have not seen them, and specimens of this, as well as of Mr. Jones' two other new species of grasses, appear to be missing from the set deposited in the National Herbarium. I think it well to call attention to this as an instance of a species of discourtesy (to use no harsher word) too often suffered by students of special groups.

Calamagrostis scopulorum is a perfectly distinct species of rather perplexing relationship. It is *not* closely allied to *C. sylvatica*, being distinguished from all species of that group by its slender, straight awn not exceeding the flowering-glume. In its spikelets it resembles *C. Aleutica*, but is widely different in its vegetative organs, habit and appearance. At first glance it appears very close to *C. Cusickii*, but is readily distinguished by the shorter and more delicate awn and longer callus-hairs. The same species was collected by Mr. Jones at Alta, Utah, in 1879 (no. 1145). Some expressions used in the description are rather peculiar, such as " spikelets appressed," " outer " and " inner *rays* " of the panicle, lower empty glume and palet " simply acute," etc. It is not usual, in describing grasses, to mention the characters of the palet before describing the flowering-glume.

In passing, it may be worth while to mention that, as Lamarck published a *Poa festucoides*, that name is not available for Mr. Jones' species, for botanists of every school have practically agreed that, from now on, at any rate, the law of homonyms shall be observed, even if it be not made retroactive. An *Elymus* with the

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* M. E. Jones, Contributions to Western Botany ; Proc. Calif. Acad. (II.) **5**: 722 1895.

"habit of *Sporobolus airoides*, but culms very different;" "spikelets single at each joint;" "loose spike like *Agropyrum glaucum*, which it much resembles;" and "most of the technical characters of *Hystrix*, but manifestly allied to *Elymus condensatus* and may prove to be only a form of it," may well be called a "remarkable plant."

T. H. KEARNEY, JR.

Proceedings of the Club.

WEDNESDAY EVENING, NOV. 27, 1985.

The President occupied the chair and there were about 50 persons present. Benjamin Heritage and Jos. A. Hays were elected active members.

The announced paper of the evening was then read by Dr. Rusby, entitled, "The Poisonous Plants of the Vicinity of New York," illustrated by lantern slides, mostly colored, and loaned by Mr. Van Brunt for the occasion. The paper was discussed by the President and Messrs. Small, Barnhart, Stewart and others. It is printed in full in the "Alumni Journal of the New York College of Pharmacy," December, 1895.

WEDNESDAY EVENING, DEC. 11, 1895.

Vice-President Lighthipe in the chair, and 52 persons present.

The Secretary called attention to the necessity for a new supply of copies of the Constitution and By-Laws and suggested that a revision of this publication be made, to include a short history of the Club. He referred also to the need of other stationery to facilitate the work of the officers of the Club, and offered a resolution that a committee to consist of the Editor, the Treasurer and the Secretary be appointed with the power to prepare a revised edition of the Constitution and By-Laws and such other stationery as is required. The resolution was unanimously adopted.

A communication from Mr. Wm. H. McDonald, of 2297 First avenue, was read, tendering a number of seeds for use in the nursery of the New York Botanical Garden.

The announced lecture of the evening, by Dr. Smith Ely Jelliffe, entitled, "Common Edible and Poisonous Fungi," illustrated by colored lantern slides, was then delivered.

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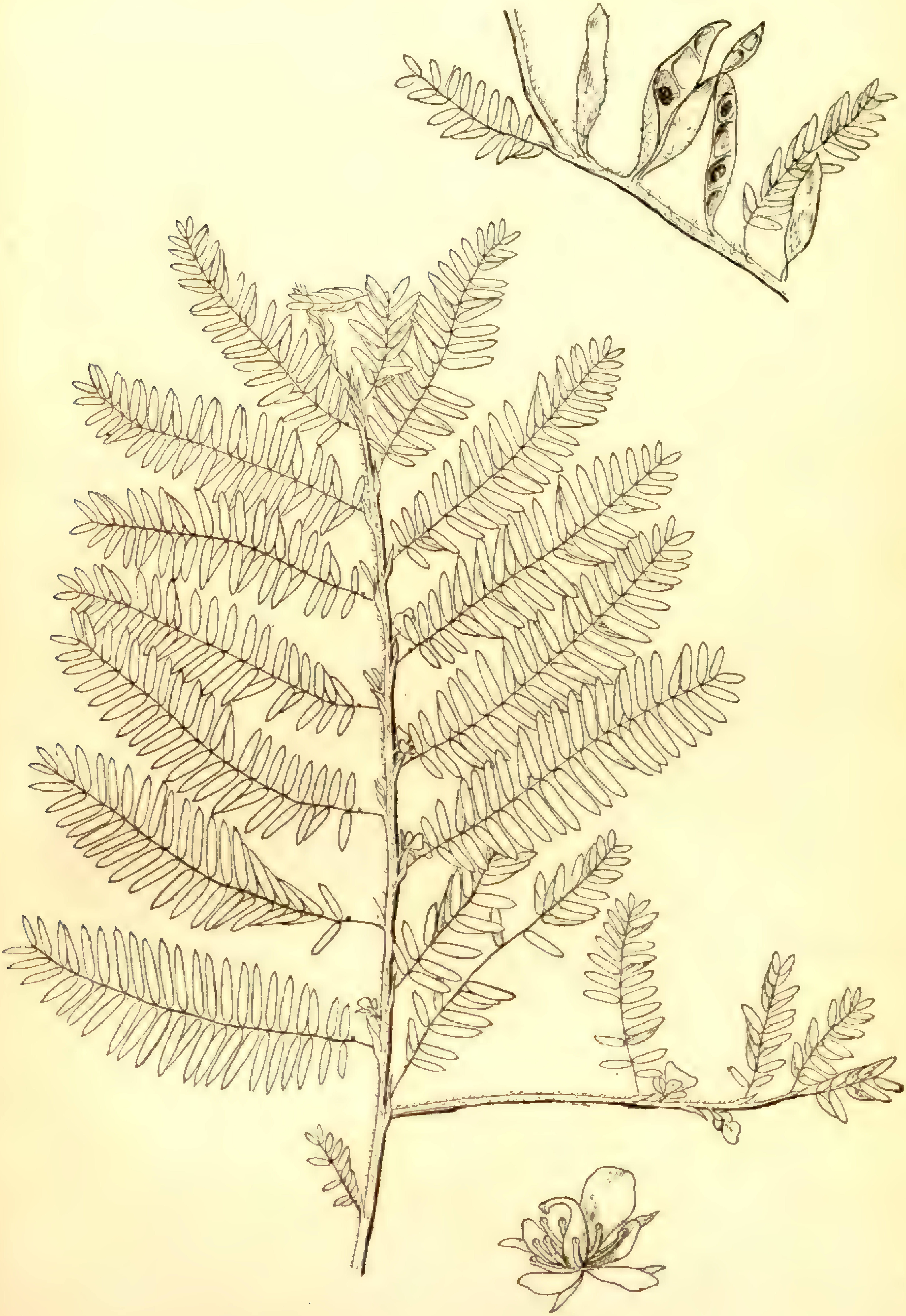

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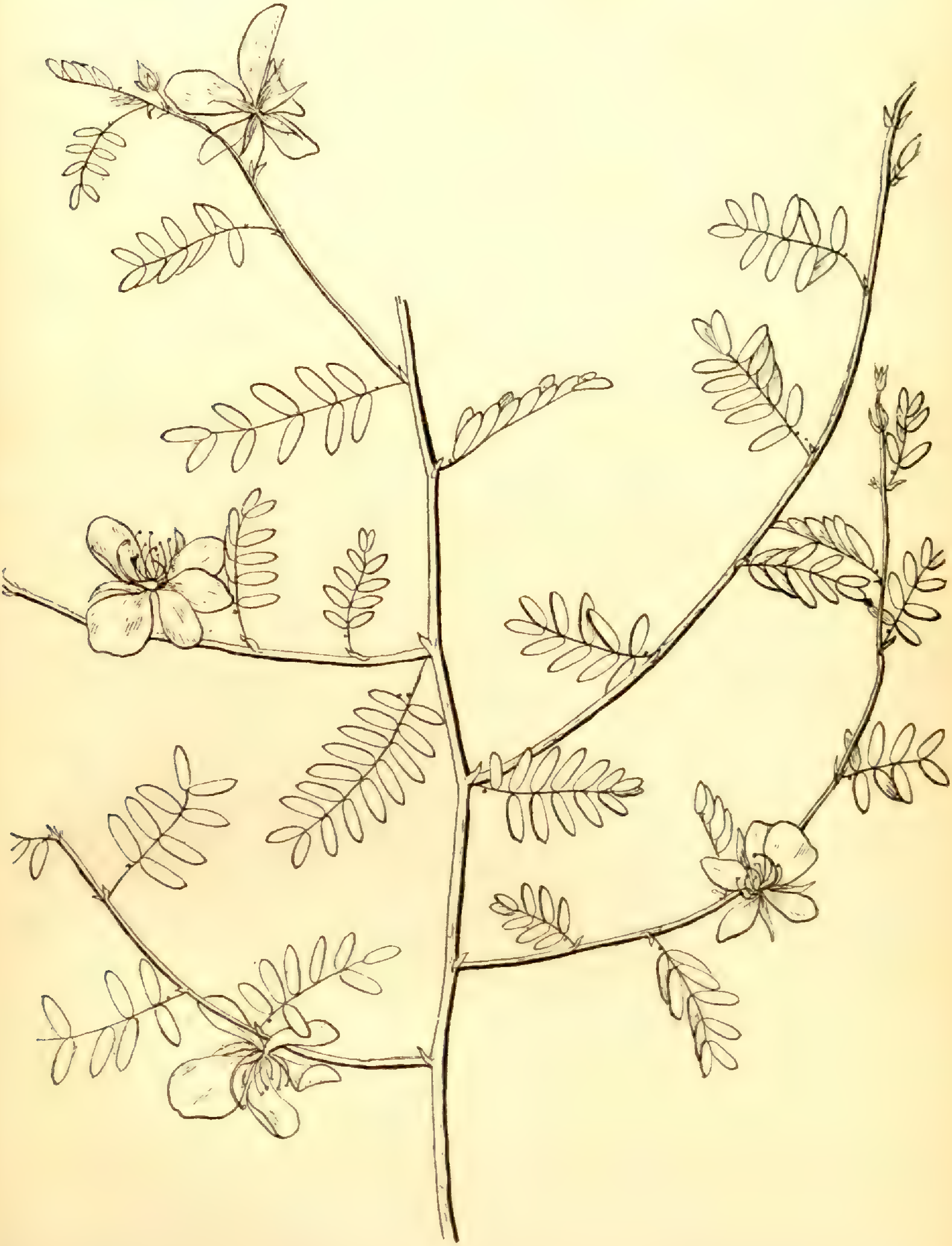

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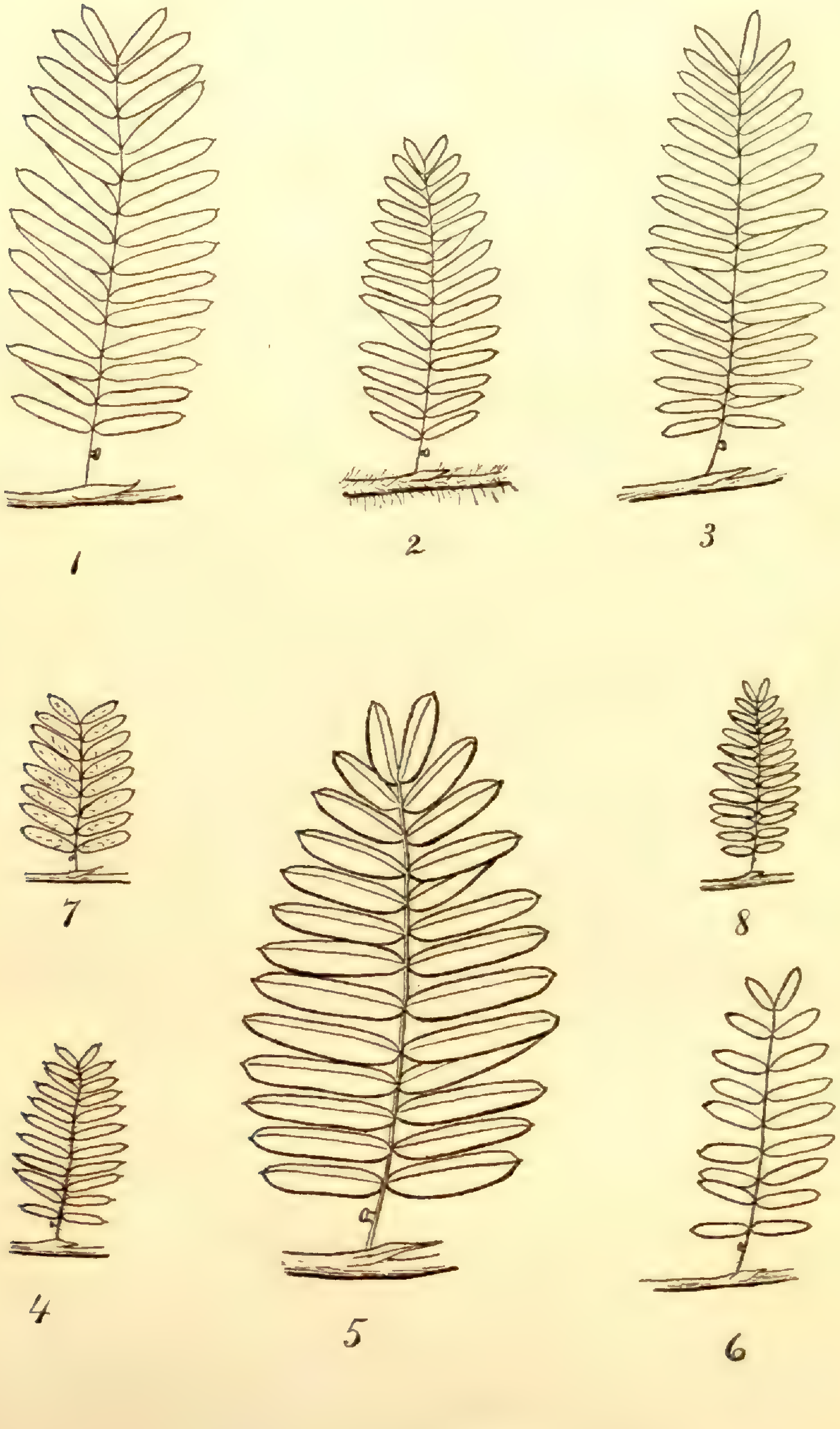

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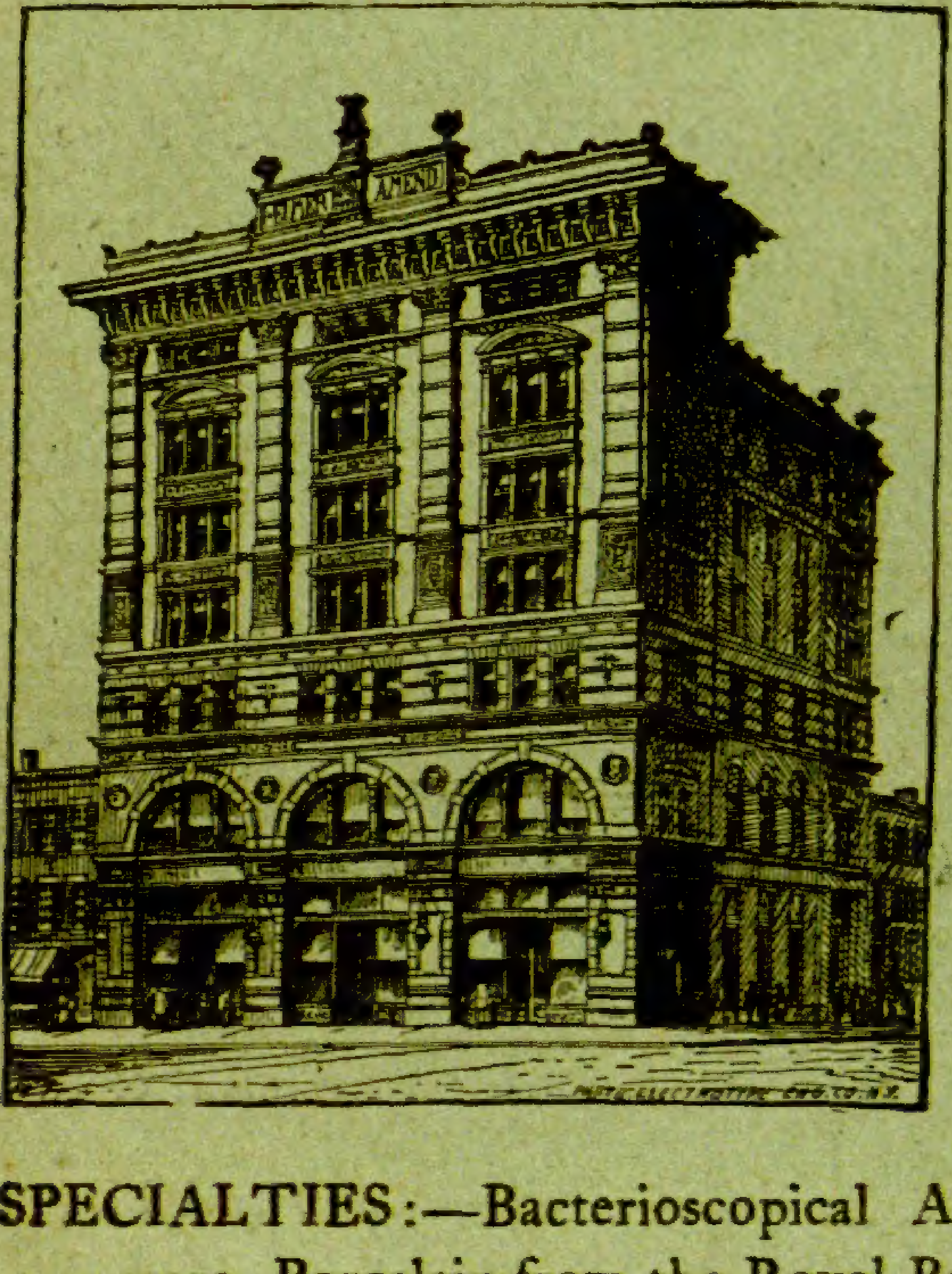

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